IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

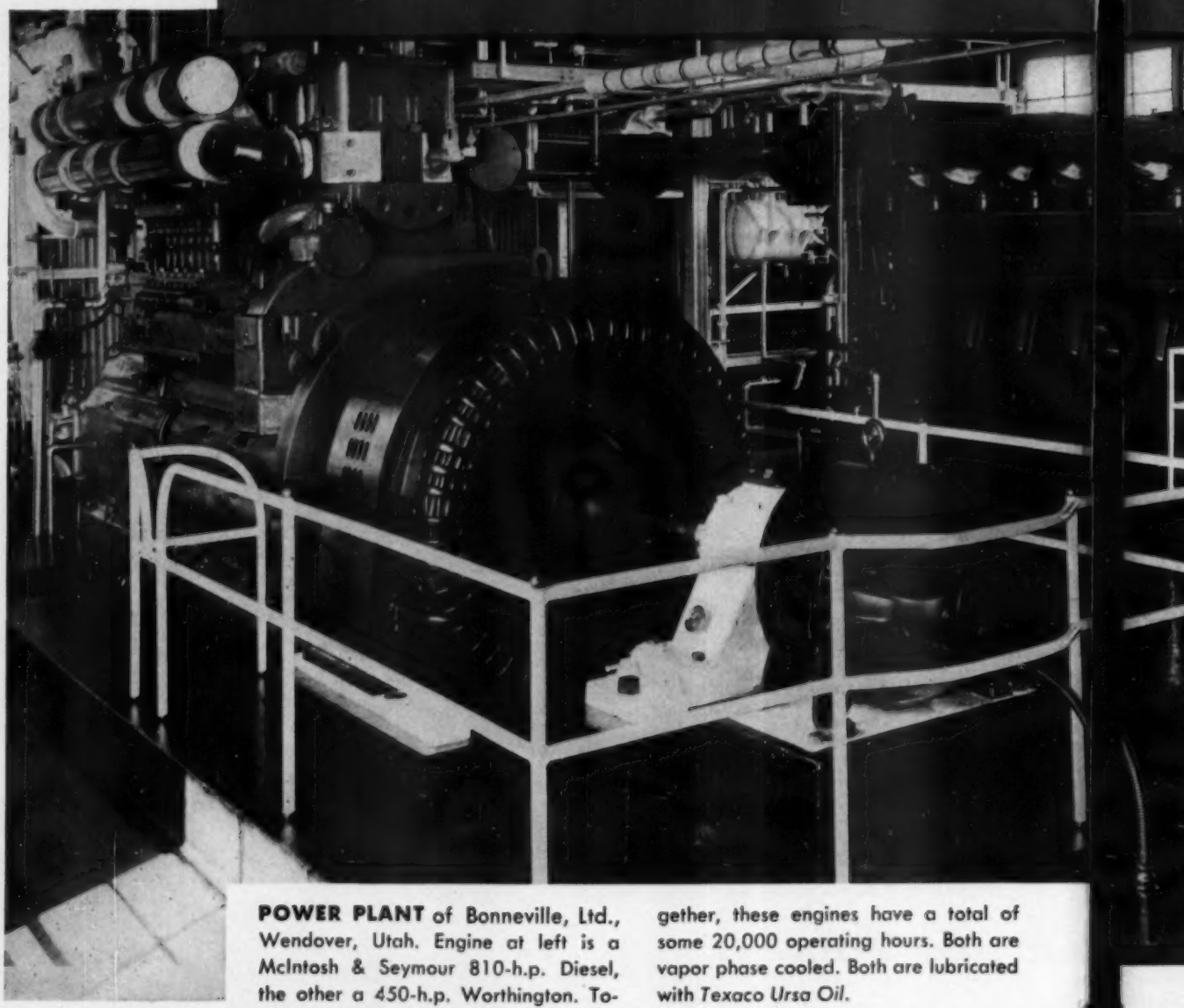
DIESEL PROGRESS

FIVE DOLLARS PER YEAR

MARCH, 1953

FIFTY CENTS PER COPY

"WORTH-WHILE AND MAINTENANCE



POWER PLANT of Bonneville, Ltd., Wendover, Utah. Engine at left is a McIntosh & Seymour 810-h.p. Diesel, the other a 450-h.p. Worthington. Together, these engines have a total of some 20,000 operating hours. Both are vapor phase cooled. Both are lubricated with *Texaco Ursa Oil*.

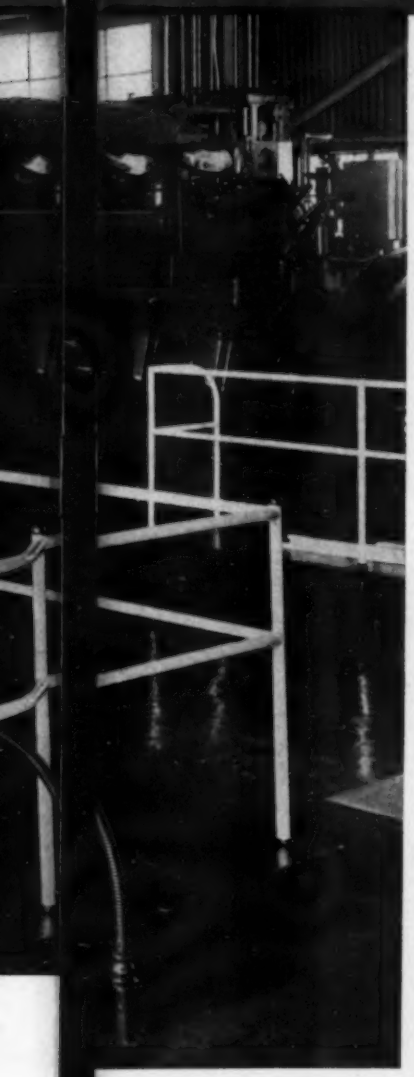
TUNE IN . . . TEXACO STAR THEATER starring **MILTON BERLE**, on television Tuesday nights. **METROPOLITAN OPERA** radio broadcasts Saturday afternoons.

TEXACO

TEXACO

DIESEL PROGRESS for March, 1953, Volume XIX, No. 3. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 816 North La Cienega Boulevard, Los Angeles 46, California. Rex W. Wadman, President. Subscription rate: $5 per year, single copy 50c. Acceptance under 34.64, P. L. & R., authorized.

SAVINGS ON OPERATING COSTS"



Bonneville, Ltd., lubricates Diesels with recommended TEXACO URSA OIL

Bonneville, Ltd., Wendover, Utah, produces potash. Most of the power needed is generated by two vapor phase cooled Diesels – a 450-h.p. Worthington and an 810-h.p. McIntosh & Seymour – operating under severe conditions.

To be sure that Bonneville got the utmost in efficiency and economy, the Texaco Lubrication Engineer recommended a *Texaco Ursa Oil* with special detergent-dispersive properties. *"Results have been very good,"* say General Superintendent Blair Lamus and Mechanical Superintendent Jesse Ecton. *"Your* Texaco Ursa Oil *has kept our Diesels cleaner than we believed possible. Savings on operating and maintenance costs have been very worth while."*

There is a complete line of *Texaco Ursa Oils,* approved by leading Diesel builders. You can get one exactly right for your Diesel, gas or dual-fuel engine – whatever the operating conditions or the type of fuel. This "versatility" is one of the reasons why –

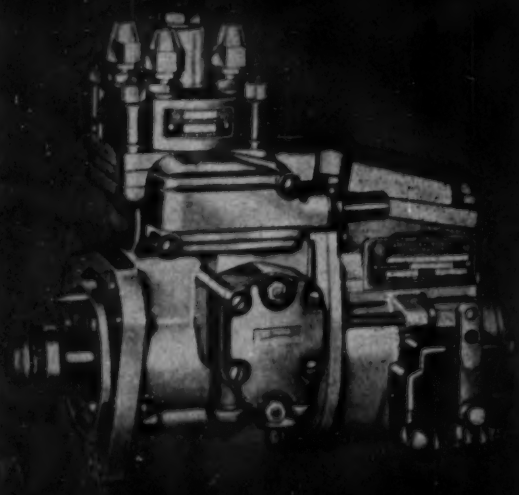
For over 15 years, more stationary Diesel h.p. in the U. S. has been lubricated with Texaco than with any other brand.

Consult a Texaco Lubrication Engineer. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

greatest single advance in diesel fuel injection...



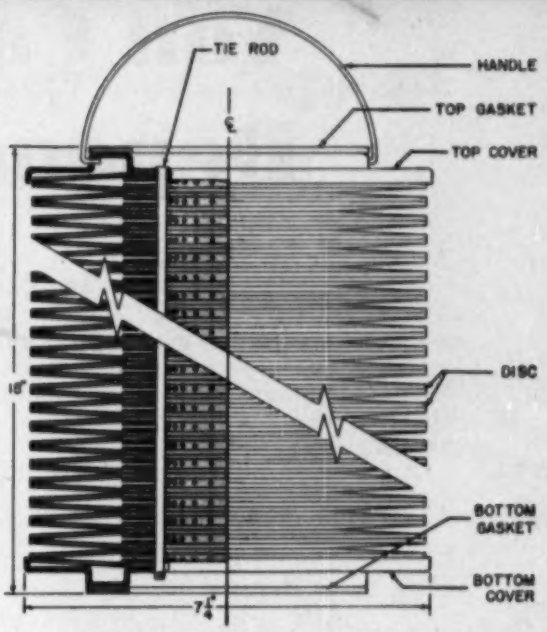
AMERICAN BOSCH

American Bosch single-plunger multi-cylinder pumps have literally revolutionized the concepts of diesel fuel injection.

This Exclusive New Cartridge

- REMOVES PARTICLES 20 MICRONS OR SMALLER
- AT FULL-FLOW RATES
- WITH ONLY 5 P.S.I. INITIAL PRESSURE DROP

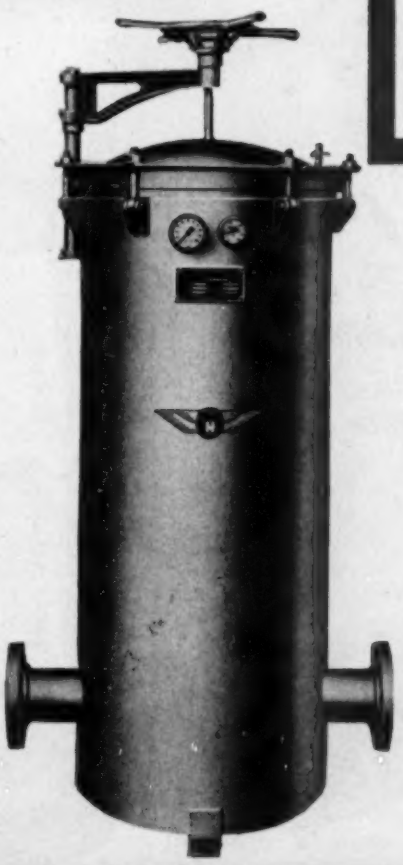
(with 150 S.S.U. Oil)



45 SQ. FT. OF FILTERING AREA are provided by the ingenious and exclusive design of each Flomaster 7 x 18 throwaway cartridge. This higher dirt-holding capacity means longer cartridge life for full-flow performance. As shown above, 135 disc assemblies comprise the filter element. Each assembly consists of two resin-treated paper discs and a separator. Passage ways in the separator allow full-flow of oil to the center manifold after passing through the disc. Each disc is sealed electronically at its periphery with a water and oil insoluble adhesive.

in the HOFFMAN Flomaster

FULL-FLOW CARTRIDGE FILTER



UNIQUE, QUICK-OPENING COVER HAS 66% FEWER BOLTS — SPEEDS CHANGES

Easily removed swing bolts secure Flomaster cover to the tank. Neoprene gasket securely held by retaining groove in the head — no loose gasket to manipulate.

Hand wheel raises cover and support swings to a 45° angle with least effort . . . cartridges thus fully exposed for easy replacement.

For full protection of bearing surfaces you want full-flow filtration of the main lubricating oil stream. With that requirement in mind, Hoffman — builder of industry's most complete line of filtration equipment — has developed the Flomaster.

In ten sizes, for full-flow rates from 75 to 900 g.p.m., the Flomaster cartridge filter removes abrasive particles down to 20 micron size or smaller. Design and construction afford minimum pressure drop — only 5 p.s.i. with 150 S.S.U. oil. Inlet and outlet connections are diametrically opposite on the same center line to permit in-line piping. Oil inlet is in center of tank for unobstructed flow through the unit.

Write for New FLOmaster Bulletin A-873 and for Literature On These Other HOFFMAN Diesel Filters.

OIL CONDITIONERS	CARTRIDGE FILTERS	DEHYDRATORS
25 to 600 g.p.h.	7 x 18 size: Bulletin A-888	Remove Fuel, Water, Air
Bulletin A-667	11 x 18 size: Bulletin A-649	Bulletin A-668

IN CANADA:

Hoffman INDUSTRIAL FILTRATION EQUIPMENT & ENGINEERING

Industrial Filtration Division

U. S. HOFFMAN MACHINERY CORPORATION

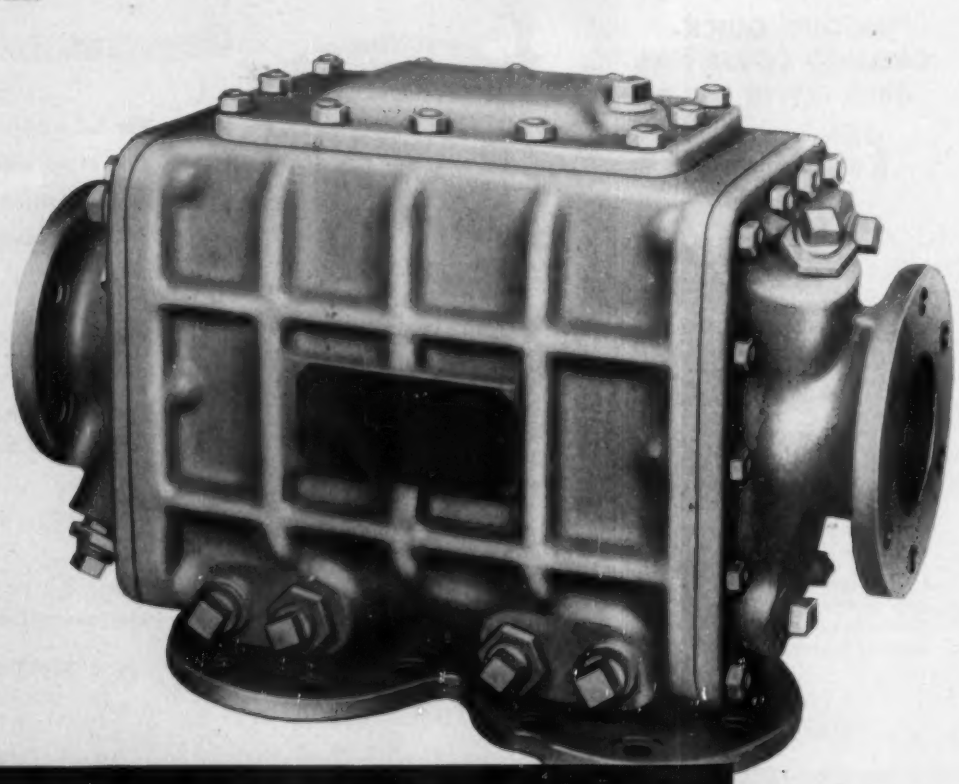
237 LAMSON STREET, SYRACUSE 4, NEW YORK

Heat Exchangers You Can Depend On

Harrison heat exchangers have the capacity, compactness and durability that Diesel engine manufacturers demand.

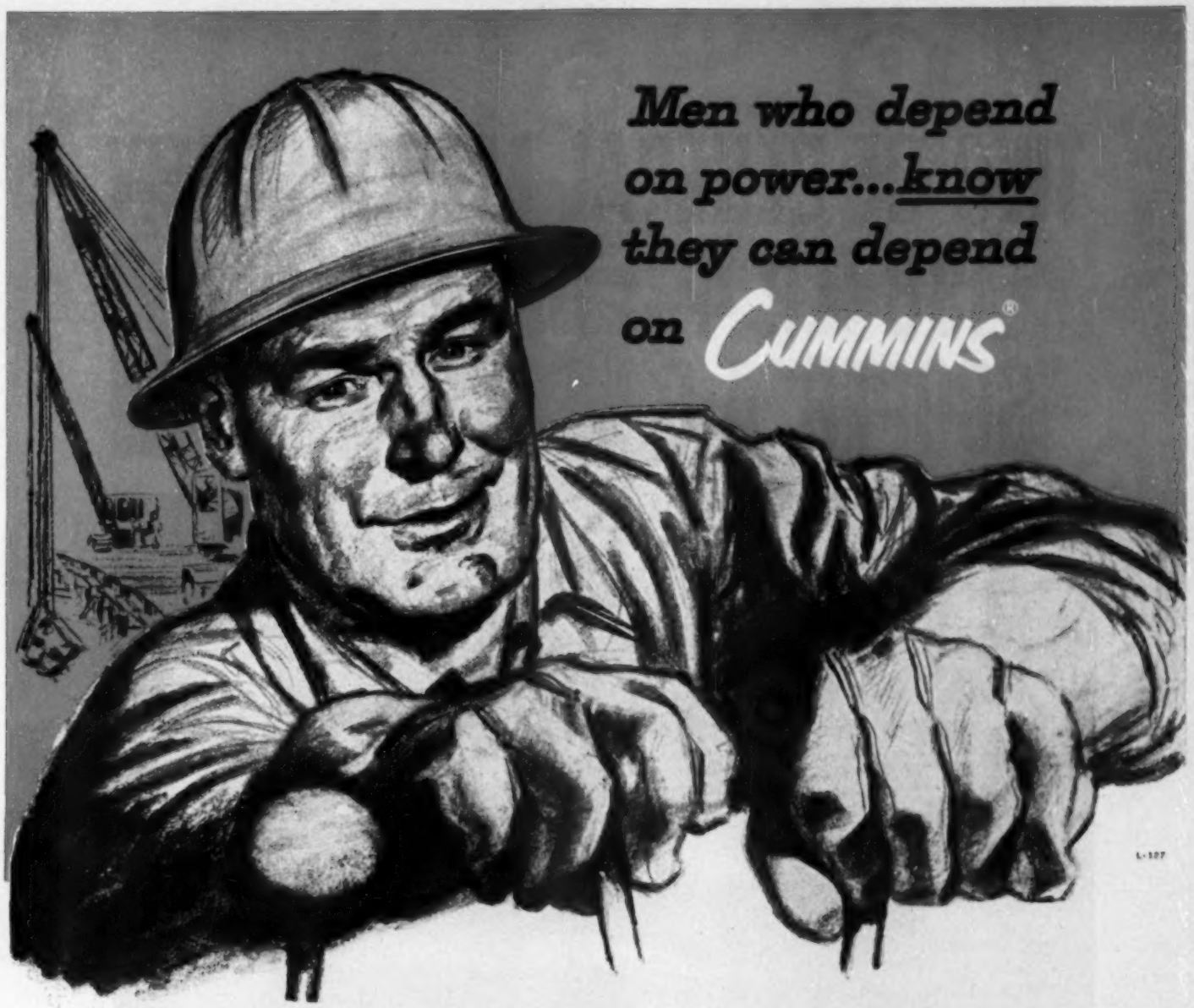
No matter what the application, Harrison heat exchangers do an efficient, dependable cooling job.

Because we have been building heat exchangers for a long time . . . because we have developed real know-how . . . we feel sure that we can be of service to you. Our representatives are as near as your telephone.



HARRISON
RADIATOR DIVISION
GENERAL MOTORS CORPORATION
LOCKPORT NEW YORK

HARRISON



CUMMINS DIESELS *are engineered to make light work of tough jobs*

Progressive, eyes-ahead engineering is one of the big reasons why so many power users pick Cummins Diesels for dependability.

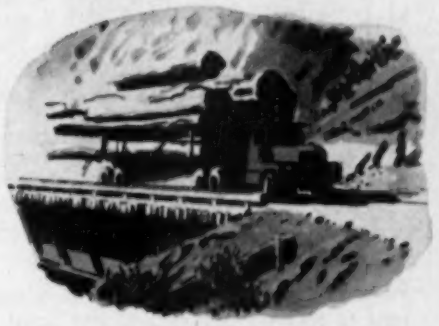
Consider Cummins' exclusive system of fuel injection and metering—an important factor in the unequalled performance records established by lightweight, high-speed (60-600 h.p.) Cummins Diesels. No other Diesel fuel system is so simple . . . so rugged! It delivers a uniform, properly prepared fuel charge to every cylinder. All under low pressure—less chance of bursting and leaking fuel lines.

Your Cummins dealer will be glad to tell you more about the exclusive fuel system and other engineering advantages built into every Cummins Diesel. He is an expert who knows the requirements of your job. He heads up a specialized parts and service organization—equipped to handle all your diesel power needs. Call him today . . . or write!

CUMMINS

CUMMINS ENGINE COMPANY, INC., Columbus, Indiana
Export: Cummins Diesel Export Corporation
Columbus, Indiana, U.S.A., Cable: CUMDIEX

***Leaders* in rugged, lightweight, high-speed diesel power!**



Enjoy the 16 mm Technicolor sound movie
"DIESEL RACE CAR"

Prints available for your private group showings! Mail this coupon to Cummins Engine Co., Inc. and we'll contact you. DP-353

Name _____

Company _____ *Position* _____

Address _____

City _____ *Zone* _____ *State* _____

TWO OF GENERAL MOTORS NEW 138 H.P. 4-71 DIESELS GIVE "SCOPER" A SPEED OF 26 MPH

Meet "Scoper," powered with a pair of General Motors new inclined 4-71 Diesels. She's a 34-foot, all-steel welded cruiser, designed and built by Sewart Seacraft Co., for fast, economical transportation of oil field personnel.

And fast she is. In trial runs for her owners, Clem Scobel of Buras, La., and B. J. Perez of New Orleans, "Scoper" was clocked at 25.1 mph with eight men aboard. Her 276 Diesel horsepower gives her a top of 26.5 mph.

Fuel consumption in these trials averaged 7.6 gallons of fuel oil per engine per hour, keeping fuel costs below $2.00 per hour. Owner Scobel says *"This is one of the finest oil field crew boats we've seen. The new GM inclined engine looks like the answer to our problem of low weight, more horsepower—and, if it lives up to the reputation of the 6-71, it will be."*

If you're looking for dependable, safer and far more economical marine power, your GM Diesel distributor has a host of new marine Diesel products. There's the new inclined 4-71—smaller, lighter and more powerful than ever. There's the all new 4-cylinder Series "51"—an amazingly compact and simple high-speed Diesel, delivering 87 H.P. at 3,000 r.p.m. There's a new 12½ K.W. permanent magnet generator set so simple in design it requires only normal servicing of the engine. And it's driven by the economical, 2-cylinder Series "51" GM Diesel. Now there's a GM Diesel for nearly every boat. Get full details from your distributor or write us.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines . . . 16 to 275 H.P. Multiple Units . . . Up to 840 H.P.

It pays to Standardize on GM DIESEL POWER

Write for folder describing new GM 4-71 "Inclined" Diesels.

THE ENGINEER'S REPORT

DATA

LUBRICANT	RPM Delo Oil R.R.
UNIT	Diesel locomotive — 65 to 12 gear ratio
SERVICE	Mountain log haul on grades to 3.7%
PERIOD	3½ years
LOCATION	Tacoma — Morton, Wash.
FIRM	The Milwaukee Road

All liners, pistons still in use after 8800 hours!

LUBRICATED WITH RPM DELO OIL R.R., engines in the specially low-geared locomotive shown at right required no replacements of bearings, pistons or liners, no major repair work of any kind during 3½ years of hard service—more than 8800 hours of engine operation and 149,859 miles of locomotive travel. Geared at a ratio of 65 to 12, the locomotive hauls up to 134 carloads of logs out of the mountains on upgrades of 2.5%. Going in, upgrades reach 3.7%.

AFTER 48,800 MILES of constant service, this assembly was removed for inspection. It proved the low liner-wear rate: Top bore diameter was 8.5025, bottom 8.501—less than 0.002 out of round!

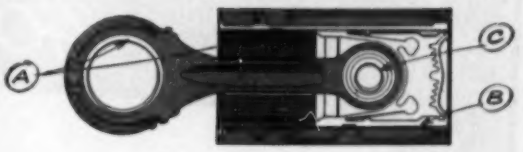
NO LACQUER DEPOSIT trouble has been encountered in the engines although they idle about 30% of the time, often in low subzero temperatures. Rings remain free, as shown in this picture.

FREE CATALOG: "How to Save Money on Equipment Operation," a new booklet full of valuable information, will be sent you on request to Standard Oil Company of California, 225 Bush St., San Francisco, Calif.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

How RPM DELO Oil R.R. prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

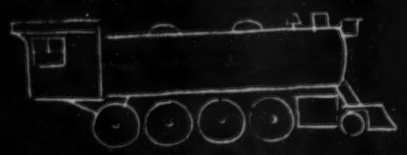
B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

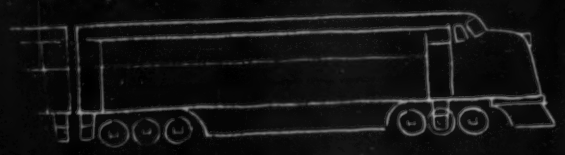
FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

AMERICA WINS THIS SCRAP!



the average steam locomotive
displaced by a General Motors Diesel



provides enough scrap metal to meet
steel production requirements for one
Diesel locomotive unit

plus — TEN 40-TON TANKS

And when railroads are completely dieselized, America will save millions of gallons of fuel oil and millions of tons of coal per year—because GM Diesel locomotives do more work on less fuel!

To conserve steel / and Fuel — America needs more Diesels!

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS

LA GRANGE, ILLINOIS—*In Canada:* GENERAL MOTORS DIESEL, LTD., LONDON, ONTARIO

If you are interested in the conservation of fuel and metals by Diesel locomotives, write Electro-Motive Division for a recent study.

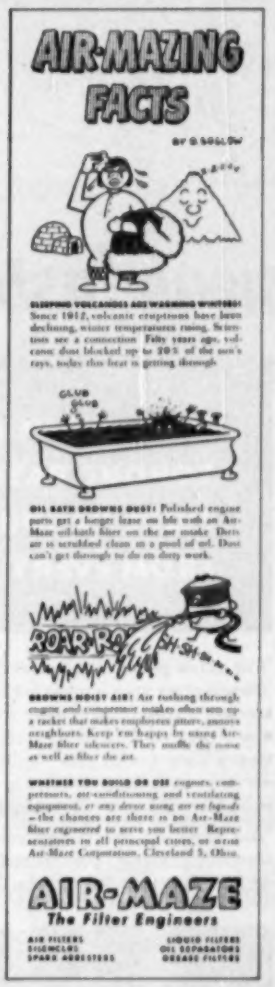
We'll pay $10.00 for AIR-MAZING facts like these:

VACUUM CLEANERS DETECT ATOMIC DUST! Warnings of any radioactive dust in the air will be flashed to Californians with the help of 19 ordinary vacuum cleaners. Equipped to trap the radioactive dust, the cleaners are mounted 20 feet above the ground to avoid street dust.

GOLD MINE IN THE SKY! Smoke from the chimneys of ore smelting plants used to carry away valuable gold, silver and copper in the form of waste dust. By trapping the dust, they now save millions of dollars worth a year.

SLEEPING VOLCANOES ARE WARMING WINTERS! Since 1912, volcanic eruptions have been declining, winter temperatures rising. Scientists see a connection. Fifty years ago, volcanic dust blocked up to 20% of the sun's rays; today this heat is getting through.

to use in national advertisements like these:

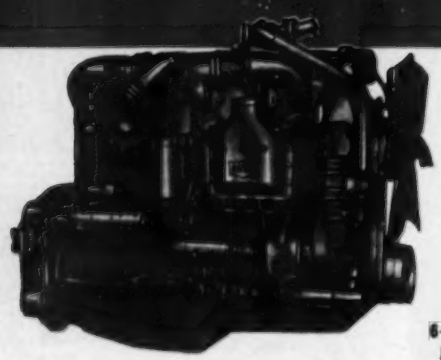


Do you know any unusual facts about dust and air like the Air-Mazing facts at the top of this page? We'll pay $10.00 for each fact we accept and publish. Send fact and source of its origin to Air-Maze Corporation, 25000 Miles Road, Cleveland 28, Ohio.

BIG DISPLACEMENT Buda Diesels

...mean faster loading, traveling, spreading

MORE POWER... GREATER TORQUE PAYS OFF IN MORE PRODUCTION FROM EVERY UNIT



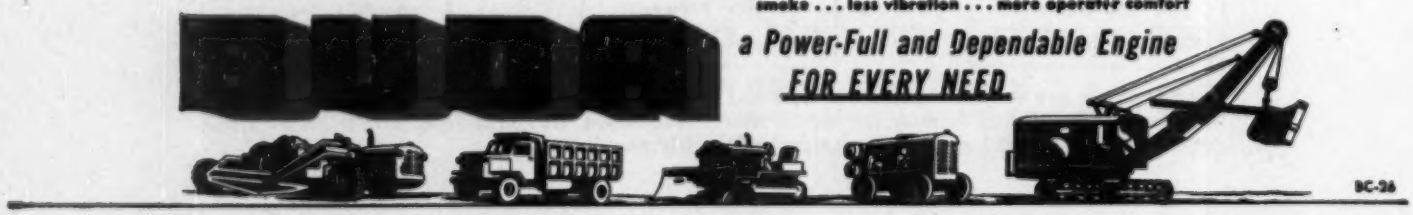
6-DAS-844 Supercharged
280 HP at 2100 RPM

The *extra* piston displacement in Buda Dyna-Swirl Diesels gives your equipment more power and higher torque . . . resulting in more trips per hour and lower costs per yard of dirt moved. Buda Diesels are heavy duty workhorses—built to stand up to tough service . . . to keep delivering maximum horsepower with less maintenance and downtime.

You need all the power you can get for dozers, scrapers, tractors, shovels and trucks—and you can get *more* power from Buda Diesels.

- **12 to 18% MORE HORSEPOWER at normal operating speeds**
- **10 to 17% HIGHER USEABLE TORQUE for greater lugging ability**
- **Dyna-Swirl Combustion gives more power per gallon of fuel . . . less fuel for more power**
- **6000 or more hours of operation between overhauls . . . lower maintenance costs per hour of operation**
- **Smooth, quiet operation . . . less exhaust fumes and smoke . . . less vibration . . . more operator comfort**

a Power-Full and Dependable Engine
FOR EVERY NEED



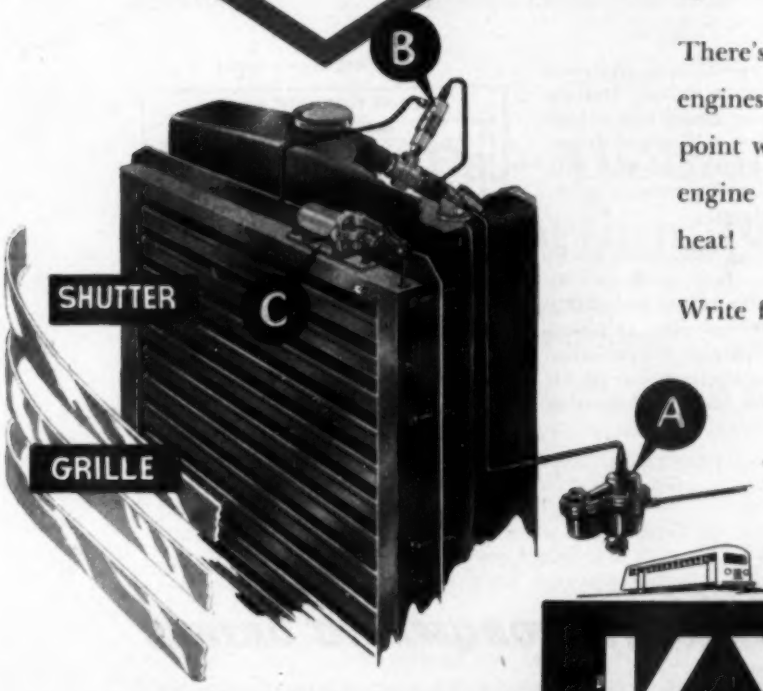
BC-26

Manufacturers of Material Handling Equipment, Lifting Jacks, Maintenance of Way Products, Earth Drills and Diesel and Gasoline Engines

KYSOR controls temperature for "PEAK O' POWER" performance

STRETCHES ENGINE LIFE

A. Air Filter. B. Shutterstat. C. Air Cylinder. Fully automatic, Kysor shutters lengthen engine life, cut maintenance costs.

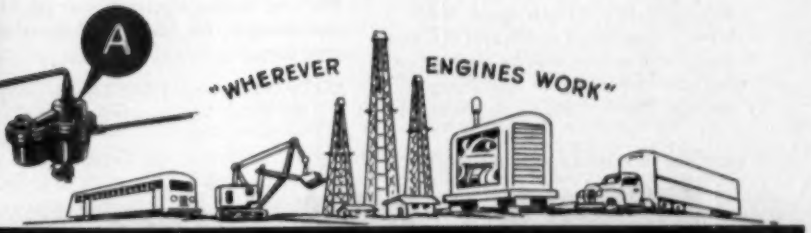


KYSOR wipes out abnormal engine wear and damage due to extremes in engine operating temperature. With KYSOR on the job, engine operating temperature is rigidly, faithfully controlled within 8° limits.

KYSOR Automatic Shutters allow the coolant *constant flow* without interruption—without sharp changes in temperature and resultant sludge build-up.

There's a point in operating temperature where engines work at peak efficiency . . . and that's the point where KYSOR keeps 'em . . . whether the engine labors in subzero cold or Death Valley heat!

Write for complete information to:



KYSOR HEATER COMPANY
CADILLAC, MICHIGAN

KYSOR
Automatic SHUTTERS

Smooth Starts

mean low operating costs

When a rear-dump truck pulls away smoothly from a shovel with a 30-ton pay load — without jolts and jerks — it's sure to stay on the job longer with less down time.

Trucks equipped with Allison TORQMATIC converters and transmissions always start smoothly—because TORQMATIC DRIVES absorb these shocks instead of transmitting them to other truck parts.

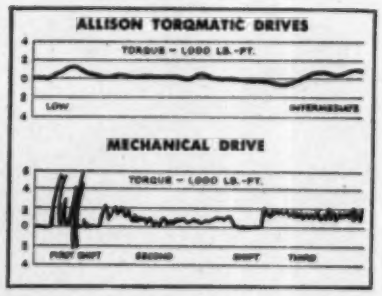
To demonstrate this, Allison engineers measured power-train shock loads in a large number of earth-moving, coal and ore-hauling trucks under both normal and extreme operating conditions. These charts show the results.

Trucks equipped with Allison TORQMATIC DRIVES showed starting shock loads four times less severe than trucks using mechanical drives. Furthermore, trucks equipped with Allison TORQMATIC DRIVES were *quick-shifted* at full throttle.

If you're operating off-highway trucks or other heavy-duty earth-moving equipment, specify Allison TORQMATIC DRIVES, the matched team of torque converter and hydraulic transmission. Ask your dealer, equipment or engine manufacturer for further information or write to:

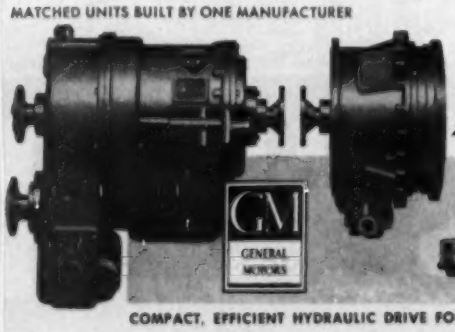
ALLISON *Division of* GENERAL MOTORS
Box 894DD, Indianapolis 6, Indiana

POWER-TRAIN SHOCK LOADS



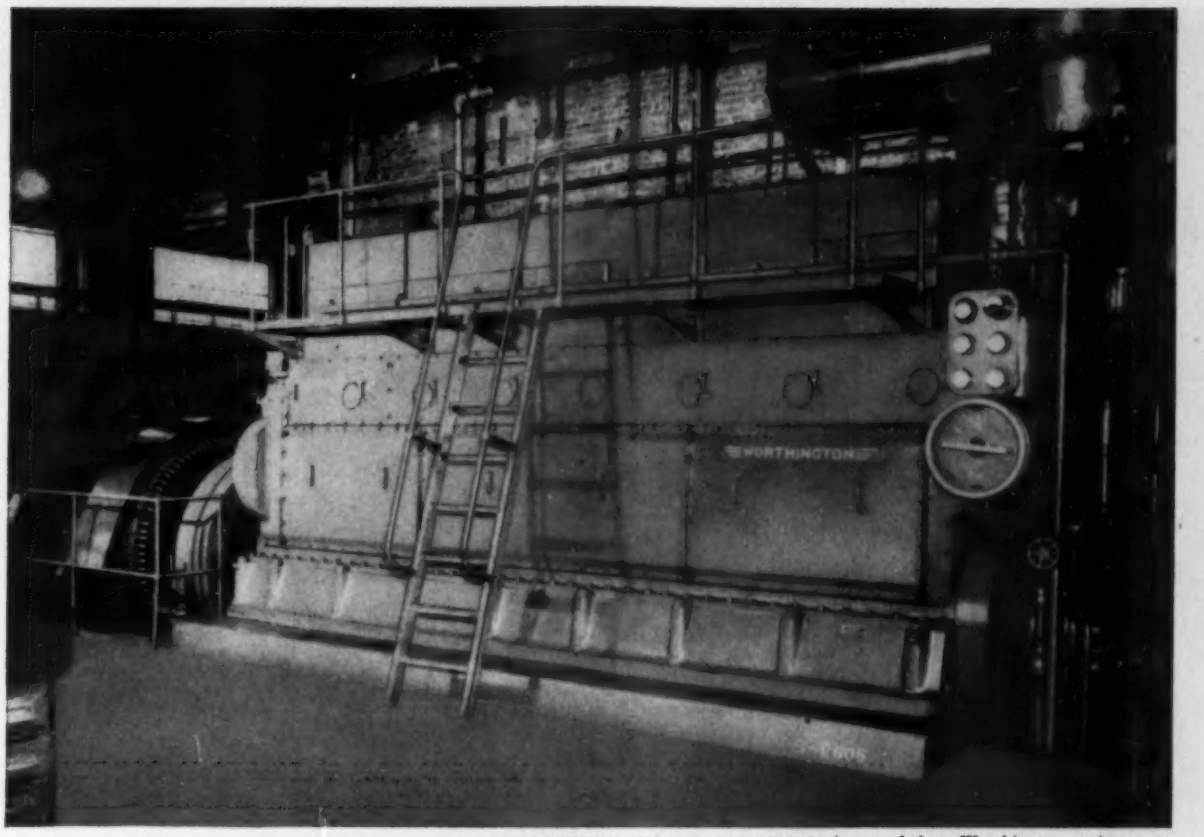
Note the jagged line—shock loads—as the mechanical drive truck pulls away from the shovel and shifts from first to second gear. Compare the smooth line—no harmful shock loads—for the truck equipped with Allison TORQMATIC DRIVES.

MATCHED UNITS BUILT BY ONE MANUFACTURER



Allison TORQMATIC DRIVES

COMPACT, EFFICIENT HYDRAULIC DRIVE FOR TRUCKS • CRANES • TRACTORS • SHOVELS • DRILLING RIGS • SCRAPERS



WORTHINGTON 1085-KW DIESEL ENGINE, is one of three Worthington engines now serving at Ford City, Pa., municipal power plant. This engine, during first 2 years of operation, logged 16,490 hrs. with average lube oil consumption of 5,400 hp hrs per gallon.

Ford City, Pa.—Another "repeat" customer of Worthington Diesels

Borough officials take pride in power plant's operating economy during 16 years

Sixteen years have passed since the first Worthington Diesel was installed in the municipal power-generation plant at Ford City, Pennsylvania.

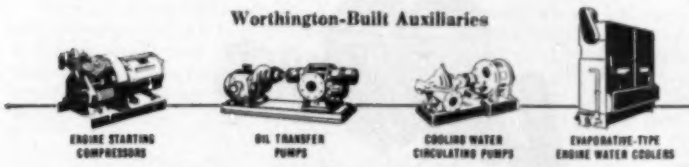
The latest installation—made in 1948—is a Worthington 1085-kw Diesel generator set. Other Worthington performers in the plant are the 300-kw unit installed in 1936 and the 462-kw unit installed in 1938.

Borough officials and the plant manager—who pride themselves on operating economy—tell us they now take for granted the dependability of their Worthington engines. Local consumers—some 6,000—have the low consumption of fuel oil and lube oil, as well as low maintenance expense, to thank for their economical rates.

Worthington's complete line of engines can give your municipal installation the most economical power no matter what fuel is used. For more data on modern Worthington engines—gas, Diesel, or dual-fuel—write Worthington Corporation, Engine Division, Buffalo, N. Y.

E-2.4

Worthington-Built Auxiliaries



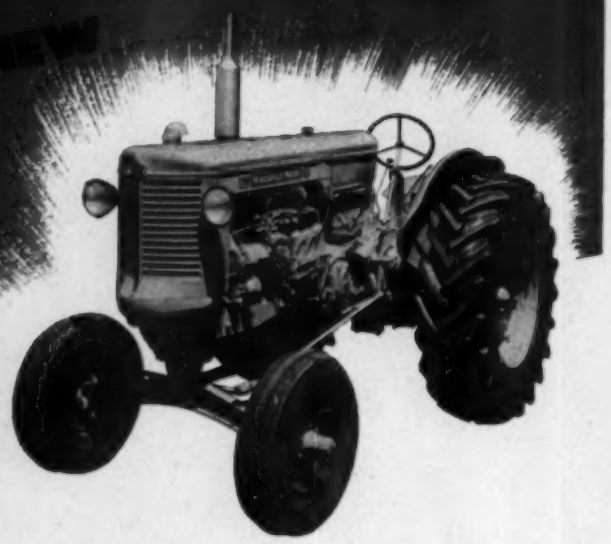
Economical Continuous Power—Diesel Engines, 150 to 2,100 hp . . . Gas Engines, 190 to 2,100 hp . . . Dual Fuel Engines, 150 to 2,100 hp.

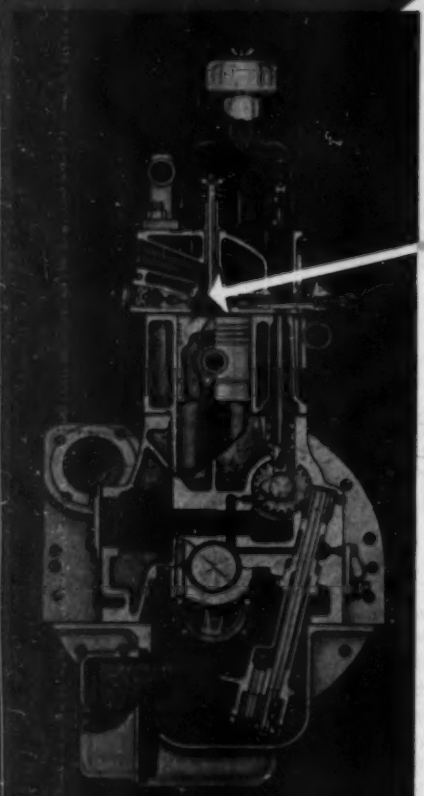
WORTHINGTON
Engines

AN OUTSTANDING NEW

Lanova

LICENSEE . . .





Cutaway view of the Model U diesel engine. The characteristic energy cell design of the Lanova combustion chamber is indicated by the arrow.

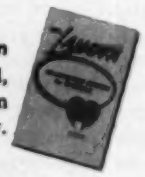
AN OUTSTANDING NEW DIESEL DEVELOPMENT

The Minneapolis-Moline Model U Tractor is making its debut ...a powerful, sturdy addition to the world-famous Minneapolis-Moline line of agricultural and industrial equipment.

One of the newsworthy features of the Model U tractor's diesel power unit is its combustion chamber design, developed for Minneapolis-Moline in Lanova Corporation testing and research laboratories. M-M engineers selected the Lanova combustion system because its high turbulence and controlled progressive fuel burning characteristics make is especially suitable for this type of service.

To users of the new Model U tractor this means high fuel efficiencies and smooth, low-cost, dependable power — advantages that are inherent in all diesels that use the Lanova combustion chamber design.

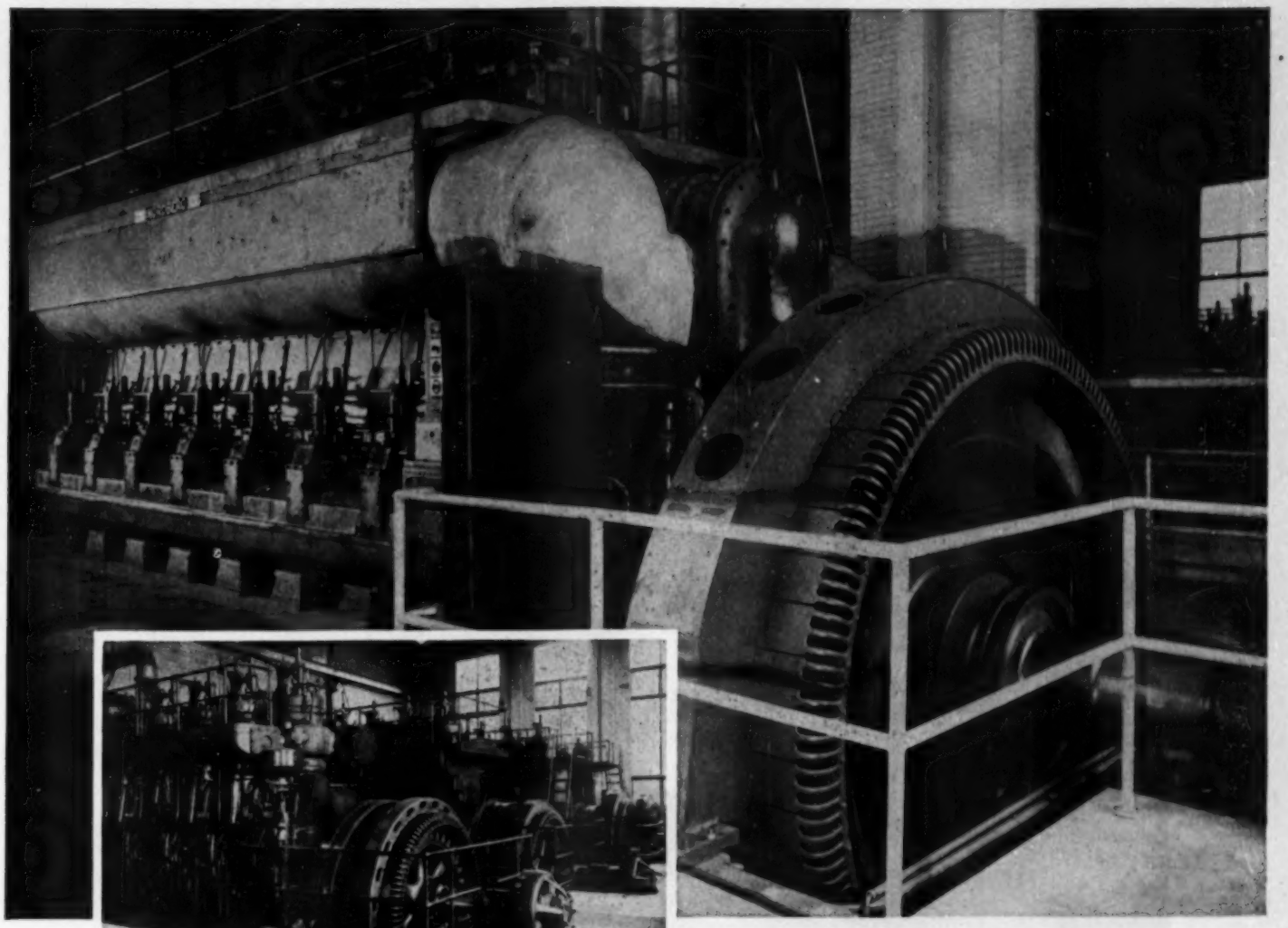
The inside story of Diesel Engine Combustion
The 58-page Lanova Handbook provides a practical, factual approach to the importance of combustion in the modern high-speed diesel. Write for a free copy.



LANOVA CORPORATION 38-17 30th Street, Long Island City 1, N.Y.

Lanova

One of America's foremost names in diesel research and development



Rensselaer, Indiana, plant gets record economy with...

● Shown above are the five diesel engines, totaling 7,150 hp., which make the Rensselaer municipal plant one of the largest of its kind in Indiana. The efficient operation of these diesels has helped keep Rensselaer's lighting rates among the lowest in the state for cities in the 2,500 to 10,000 population group.

Contributing to this successful record, Standard Oil's diesel fuel and lubricants have helped keep operating and maintenance costs low. STANDARD HD Oil has played a particularly important role. This outstanding heavy-duty lubricant has provided effective lubrication of vital cylinder areas. It has kept cylinders and rings protected against excessive wear and free from deposits. How these benefits contribute to high operating efficiency is shown by the performance of the plant's newest and largest diesel, a 2,800-hp unit. In a typical month, this unit has operated for 444 hours, carried an average load of 54%, and generated 13 kw-hr per gallon of fuel with a lubricant consumption rate of 9,414 hp-hr per gallon.

Throughout the Midwest, diesel operators are getting record efficiency and economy with the help of STANDARD HD Oil. The Standard Oil lubrication specialist in your area will be glad to give you information concerning the use of this superior heavy-duty lubricant in plants with which you may be familiar. Just phone your local Standard Oil Company office for his services. Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Illinois.

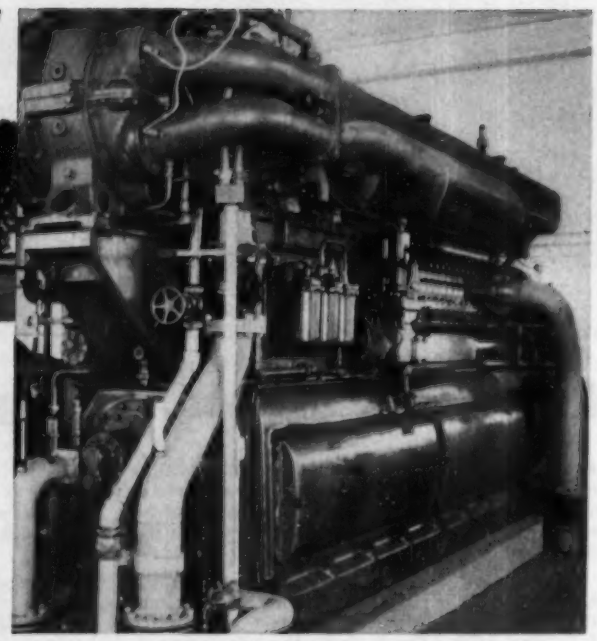
STANDARD HD
TRADE MARK
OIL

STANDARD OIL COMPANY

STANDARD (*Indiana*)

165,000 hours of service completed by 28 Alco Diesels at 98½% availability

for Gulf Refining Company



Twenty-two years ago, Gulf Refining Company installed 28 Alco Diesel Engines on its new, 700-mile Tulsa-to-Spencerville Junction pipeline. Today, those 28 Alco Diesels have completed more than 165,000 hours of service and are operating at 98½% availability. And since 1941, when the output of the line was greatly increased, they have been in actual service an average of 97% of the time.

Pumping station superintendents throughout the United States and Canada specify Alco Standardized Diesels because of this kind of *proved* dependability——and because of these economy features:

- **Compactness**—for lower construction costs
- **Higher Engine Efficiency**—for lower fuel costs
- **Medium Speed**—for lower auxiliary equipment costs
- **Flexible Power Range**—for lower expansion costs

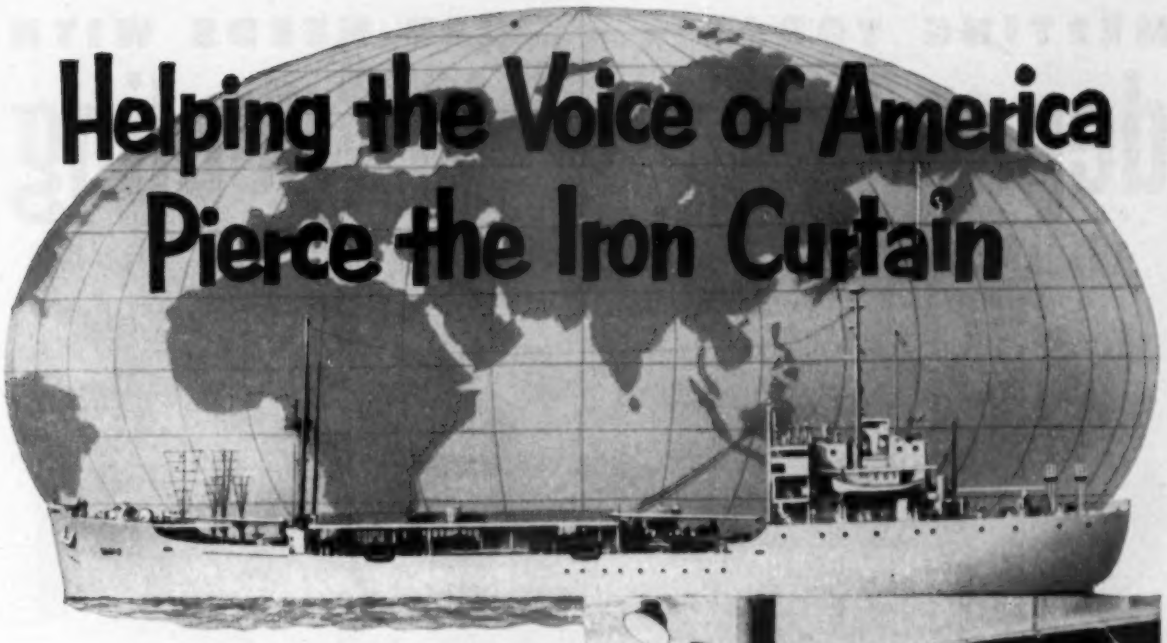
For the complete story on Alco Diesel Engines, contact your nearest American Locomotive Company Sales Office. You will find them in New York, Beaumont, Chicago, Cleveland, Houston, Kansas City, San Francisco, Schenectady and St. Louis.

ALCO DIESELS

THE MARK OF MODERN ENGINEERING

AMERICAN LOCOMOTIVE COMPANY

Helping the Voice of America Pierce the Iron Curtain

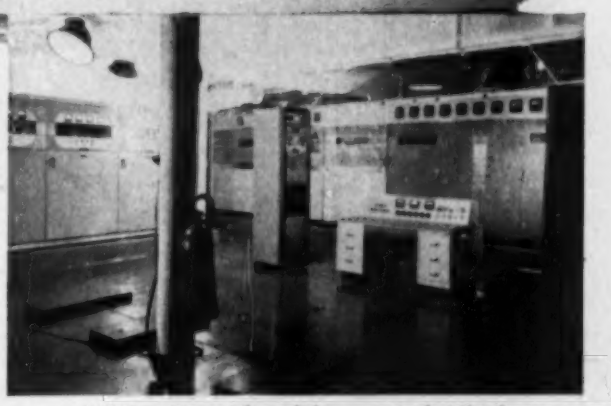


In a separate new auxiliary engine room, on the U.S. Coast Guard Cutter *Courier*, three 725 h.p. Enterprise diesels with Bendix* Fuel Injection equipment are playing an important part in helping to fight the cold war.

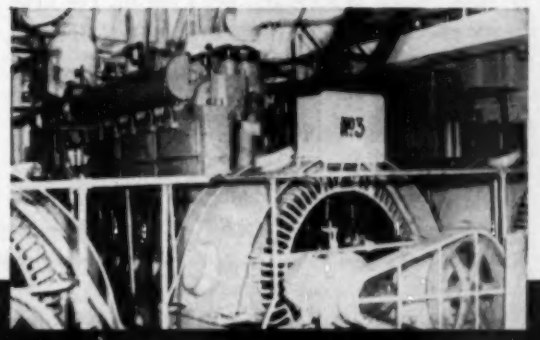
For this is the power plant that helps to transmit the Voice of America through the Iron Curtain to the captive peoples of the world.

To provide the electric power for the big transmitters, generating facilities must be capable of carrying difficult, variable loads with unvarying frequency, efficiently and dependably. Furthermore, the Enterprise diesels must continue to operate even if no better oil is available than residual fuel.

To help accomplish this important yet difficult task, Bendix Fuel Injection equipment was selected. In fact, wherever unusual performance standards are required, there is no better choice in fuel injection equipment than Bendix for complete dependability. *REG. U.S. PAT. OFF.



Main transmitter room from which programs can be initiated or Voice of America broadcasts from land based points can be relayed out again with greatly amplified range and power.



Power for the 150,000 watt medium wave transmitter and two 35,000 watt short wave transmitters is supplied by three Enterprise diesel engines with Bendix Fuel Injection equipment.

Bendix

SCINTILLA MAGNETO DIVISION of

Bendix AVIATION CORPORATION

SIDNEY, NEW YORK

Western Market Office: 582 Market Street, San Francisco, Calif.

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.

MEETING TODAY'S POWER NEEDS WITH

dependable engine cooling

YOUNG SECTIONAL-TYPE CORE RADIATOR

for lube oil and jacket water cooling

The Sterling Engine Company, Buffalo, N. Y., selects Young "Mono-Weld" Radiators with sectional-type cores for dependable and economical cooling of lube oil and jacket water for a number of Diesel-generator units built for the Corps of Engineers, U. S. Army. These Young Radiators dissipate 2,250,000 Btu's per hr. for each of the 500-kw semi-portable Diesel generator sets.

As illustrated, many Young Heat Transfer products are serving in stationary, portable and stand-by power plants, in oil-field pipeline compressor and booster stations, etc. One-piece or sectional-type core Radiators are available in various sizes, dissipating from 70,000 to 3,250,000 Btu's per hr. For details, see your Young Distributor or write direct.

OTHER YOUNG ENGINEERED PRODUCTS
FOR POWER GENERATING PLANTS
Transformer Oil Coolers
Heat Exchangers
"OSH" Unit Oil Coolers
Intercoolers
Evaporative Coolers and Condensers
"HC" (left) and "VAD" Vertical Air Discharge Coolers and Condensers

YOUNG

Heat Transfer Products for Automotive and Industrial Applications.

Young Quality

Reg. U. S. Pat. Off.

Heating, Cooling, Air Conditioning Products for Home and Industry.

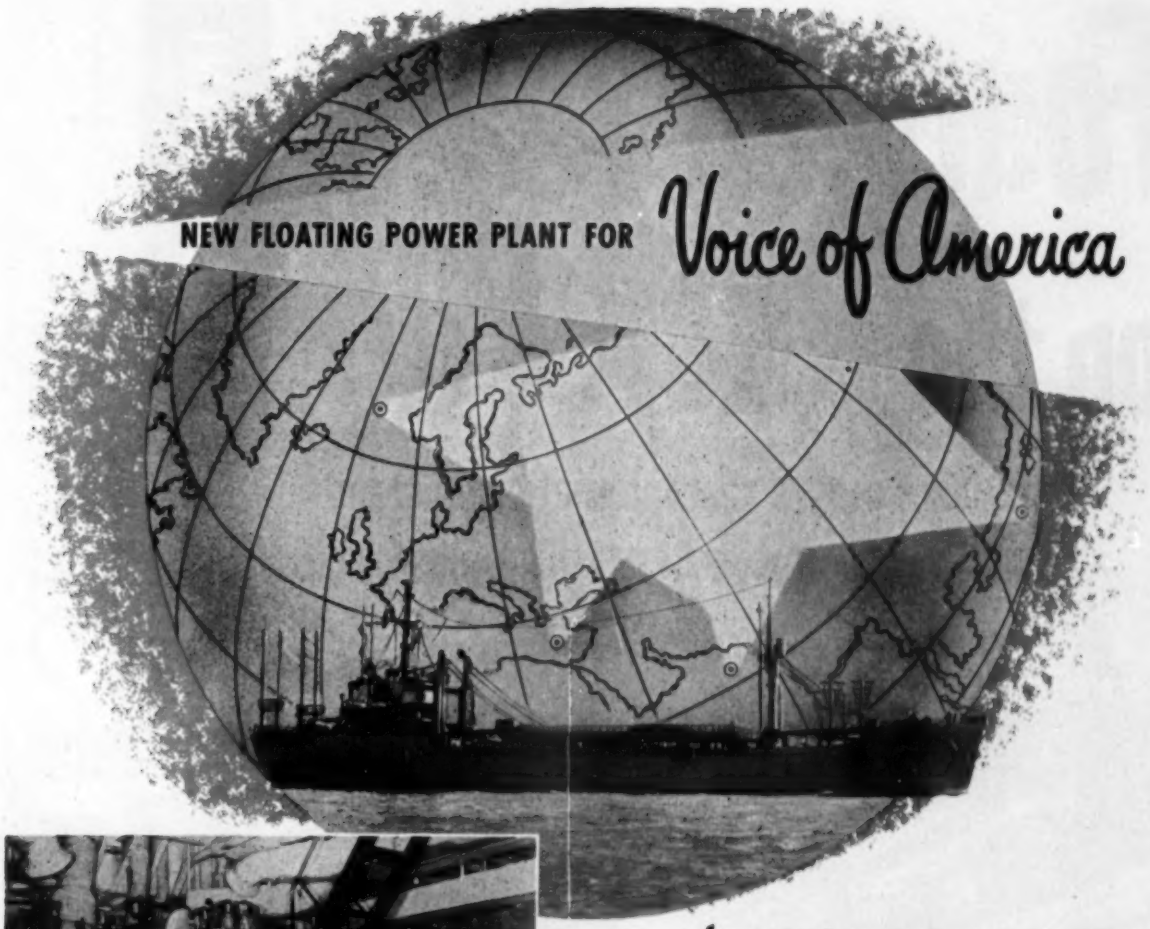
YOUNG RADIATOR COMPANY

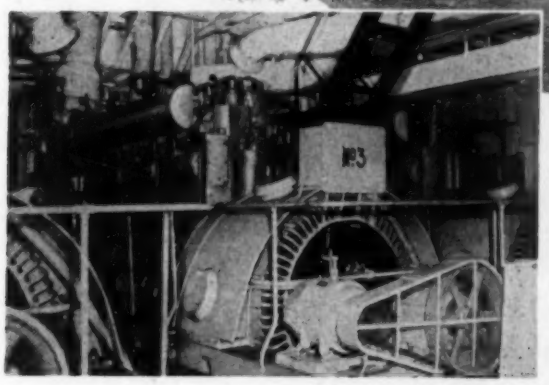
Dept. 561-K, RACINE, WISCONSIN

Factories at Racine, Wisconsin and Mattoon, Illinois

Sales and Engineering Representatives in All Principal Cities

NEW FLOATING POWER PLANT FOR *Voice of America*





U. S. Coast Guard Official Photos

Three Model DSG-316 Enterprise Turbocharged Diesels, rated 725 HP at 514 rpm, furnish all the power for the COURIER'S 150,000 watt medium wave transmitter and the two 35,000 watt short wave transmitters. Engines are 6 cylinder, 4-cycle, 12" bore x 15" stroke.

The Choice of Power Experts

ENTERPRISE ENGINE & MACHINERY CO.
A Subsidiary of General Metals Corporation
18th & Florida Sts., San Francisco 10, California

BOSTON • CHICAGO • SAN DIEGO
FT. WORTH • LOS ANGELES • NEW ORLEANS • NEW YORK
SEATTLE • ST. LOUIS • WASHINGTON, D. C.

Largest TRANSMITTER AFLOAT —POWERED BY ENTERPRISE DIESELS

Speeding swiftly from one corner of the globe to another, the newly converted USCGC COURIER relays Voice of America broadcasts to freedom-hungry peoples everywhere —over the most powerful radio transmitter afloat!

Selected to supply the power for this exacting task were three ENTERPRISE Diesels, designed to handle either standard diesel or any available crude or residual fuel oil. This fuel flexibility assures continuous transmitter operation regardless of fuel available in remote ports.

In addition to increasing engine efficiency, ENTERPRISE utilizes *Vapor Phase Cooling* to produce ample steam for condensation to 3,000 or more gallons of fresh water a day. Compared to other methods, savings in the COURIER'S water condensation cost alone will amount to nearly $15,000 a year!

Enterprise DEPENDABLE Diesels

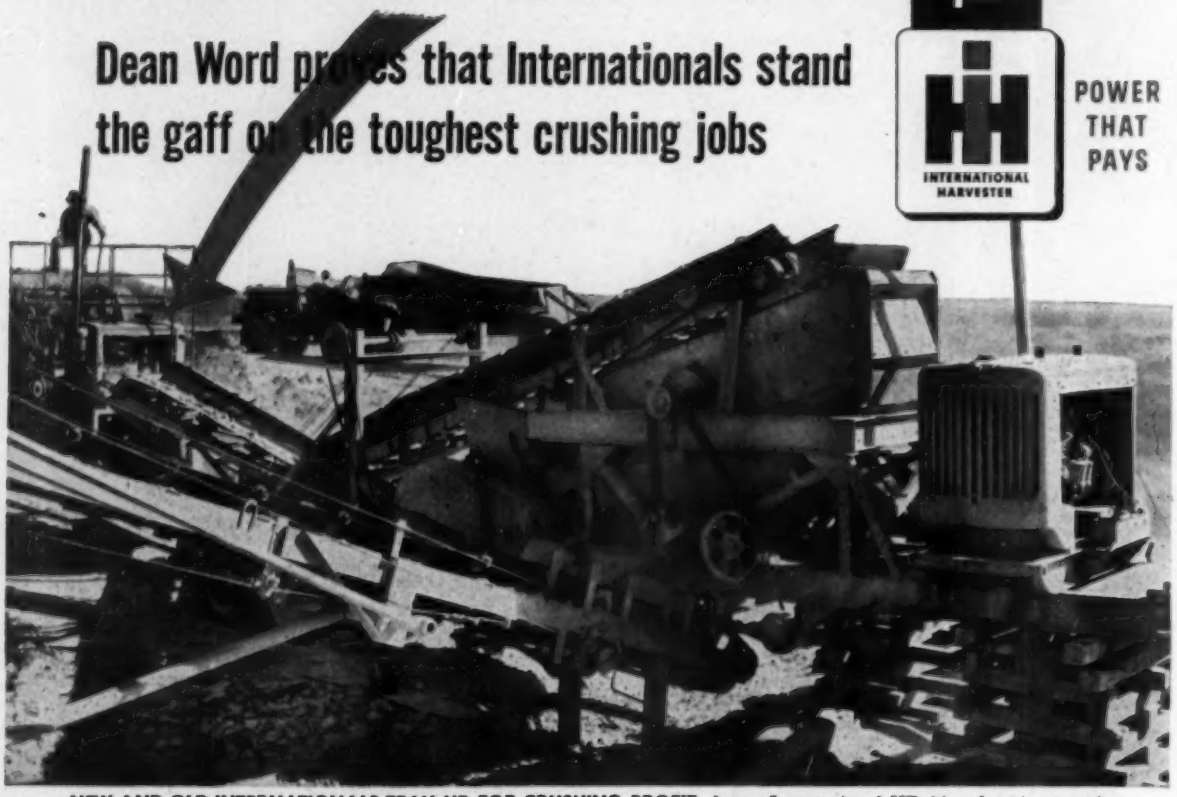
Fourteen Years on the Rock Pile

INTERNATIONAL

INTERNATIONAL HARVESTER

POWER THAT PAYS

Dean Word proves that Internationals stand the gaff on the toughest crushing jobs



NEW AND OLD INTERNATIONALS TEAM UP FOR CRUSHING PROFIT. A new International UD-24 and a 14-year-old International engine (left background) power crushing plant that turns out 700 cubic yards of road rock per 8-hour shift for the Dean Word Company of New Braunfels, Texas.

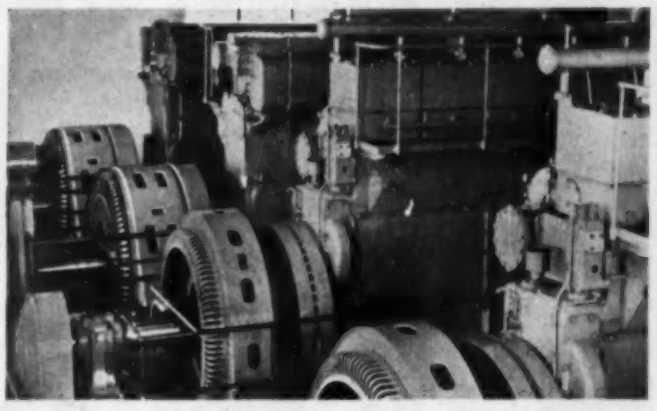
Dean Word Company purchased a new International UD-24 on the record of a 14-year-old International that has been powering their primary jaw crusher for years.

Superintendent Erwin Smith says: "That old International shows the performance that can be built into an engine. It went to work on our crusher in 1937, gets the valves ground or new rings when we get around to it every four or five years, and it runs as good today as when it left the factory. We bought the new UD-24 on the record of the old engine."

Wherever steady, year-after-year power is needed for the heavy crushing jobs, you'll find Internationals in the pit. Your International Industrial Distributor or Power Unit Dealer will be glad to show you several models to fit your power requirements. Find out about his up-to-the-minute repair shops and his full parts stock, backed by a neighboring International Harvester Parts Depot. Get the facts on International "*Power that Pays.*"

INTERNATIONAL HARVESTER COMPANY
CHICAGO 1, ILLINOIS

"12,000 H.P. Hours per Gallon with Sinclair RUBILENE"



... says Leo D. Bradley, Manager
Western Michigan Electric Co-operative, Scottville, Michigan

"Our two Cooper Bessemer super-charged 1600 H.P. Model LS8T diesels deliver over 12,000 H.P. Hours per gallon of Sinclair RUBILENE H.D. Oil consumed," says Leo D. Bradley.

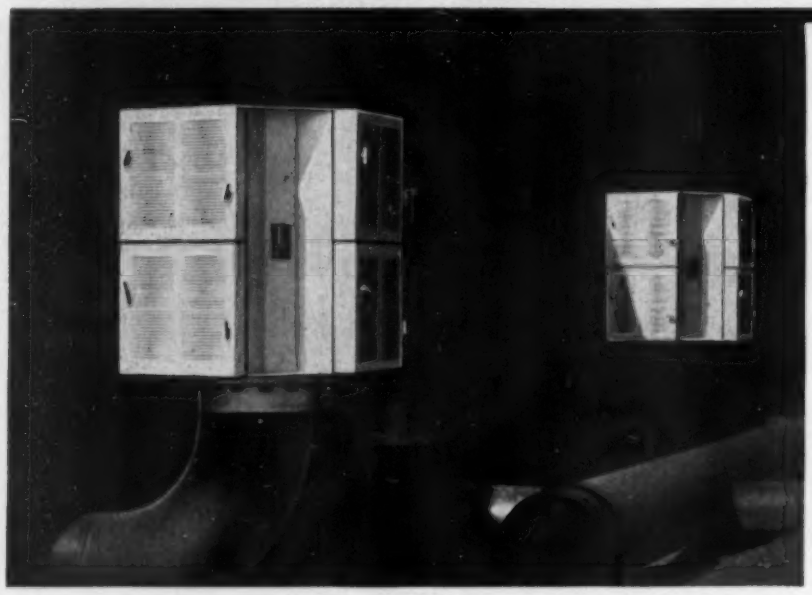
"We give much of the credit to the quality of this oil," continues Mr. Bradley. "RUBILENE® keeps our diesels exceptionally clean. Wear is kept at a minimum – the result is high efficiency ... low operating costs ... and low maintenance cost."

Sinclair Products have been used since the generating station first went into operation – 12 years ago. The recommendations made by a Sinclair Lubrication Engineer at that time plus continuous counseling service and superior Sinclair Products have meant substantial savings for this co-operative.

Perhaps a Sinclair Lubrication Engineer can help solve some of your lubrication problems. Phone your local Sinclair Representative or write to Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR DIESEL LUBRICANTS
prolong engine life

GUARD THE INTAKE and CUT YOUR OUTGO!*



***AAF "OC-H" Filters Eliminate Costly Repairs and Time Losses Due to Dust Damage**

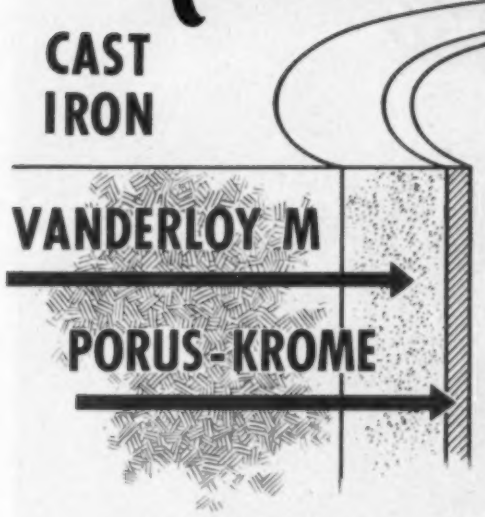
You're actually "piping trouble" to your engines and compressors when you fail to properly filter the air at the intake. The result is always the same—always costly—major repairs accompanied by important production losses.

Nor does the presence of just any filter at the intake guarantee protection. If it's doing a job short of perfection, you are merely delaying your troubles. That's why AAF's Type "OC-H" Air Intake Filter is a favorite in the field. This washable unit-type filter combines high cleaning efficiency with low resistance to air flow and large dust holding capacity. Its first cost is low, and sturdy construction assures long, trouble-free operation.

Don't let "dust protection" be an afterthought in your planning. AAF's complete line of Air Intake Filters permits the selection of the most economical and efficient unit for handling your specific dust loads. Write us today for complete catalog information.

AAF **American Air Filter**
COMPANY INC.
408 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q.

Reverse the Wear...



VAN DER HORST

Why not reverse the effect of wear in your Diesel liners? It's as easy as going astern. Have them Van der Horst processed!

With VANDERLOY M we can plate back any liner you have to original size — and with PORUS-KROME* we can keep it that way.

Cylinders we first plated before World War II are still in service! The cost is lower than for new (and hard to get) replacements. Yet each Van der Horst renewal more than pays for itself.

It cuts out the need for oversize pistons and rings, lowers fuel and lube oil consumption and reduces engine layup time to a minimum.

That's why such power plants as those in the Oslo Fjord were equipped with Van der Horst liners from the start. The same is true for thousands of Diesel craft, including surface and submarine units of the U. S. Navy.

So, when it's time to replace liners, have us "reverse the wear". Our warranty — as to cost, delivery schedule and the service life of Van der Horst liners — is yours for the asking. W52-3M

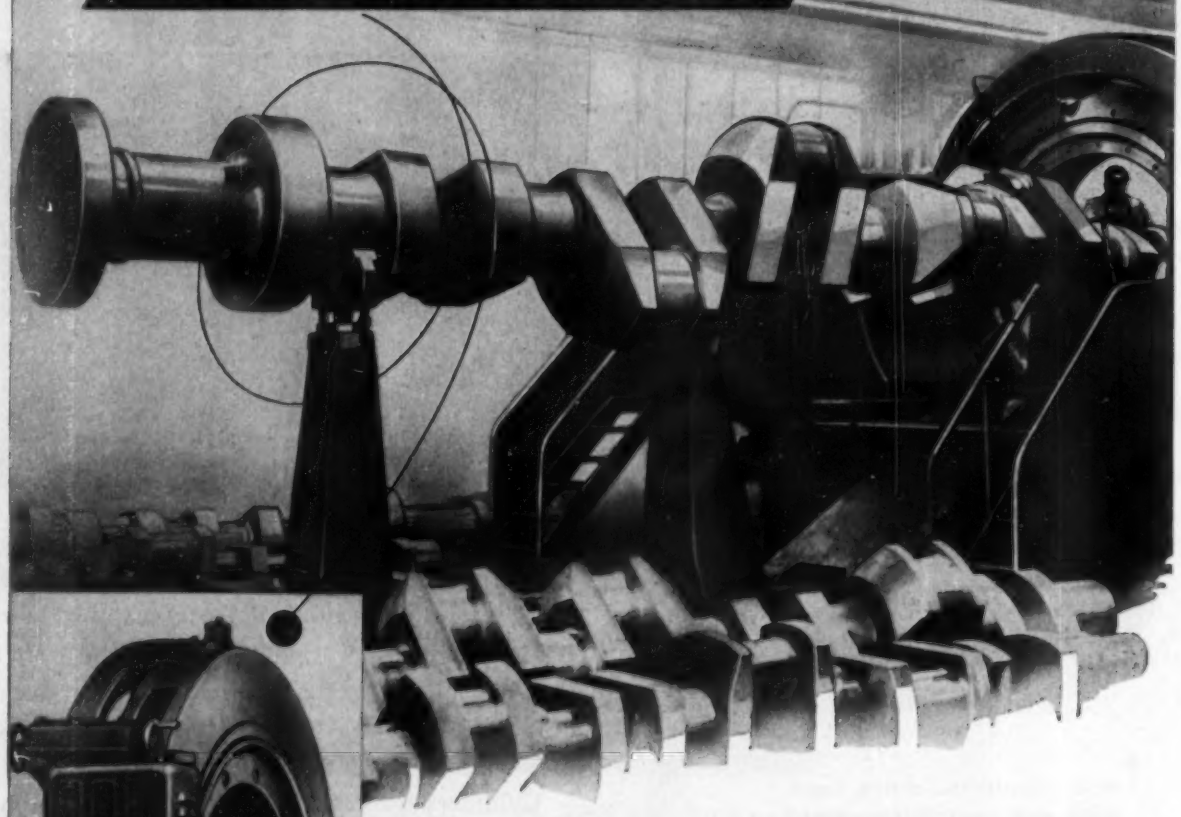
* *PORUS-KROME is a dense, hard, wear and corrosion-resistant chromium, produced by the Van der Horst Corporation of America, and which gives working surfaces an infinite number of tiny oil-retaining reservoirs for perfected lubrication.*

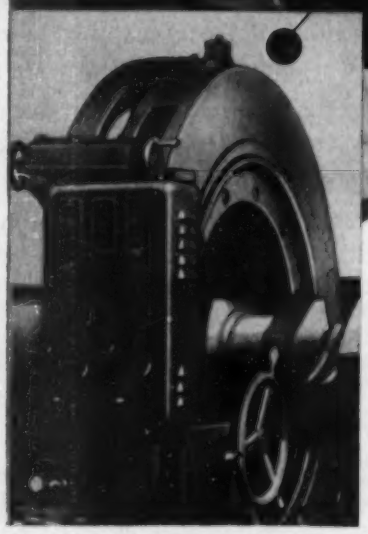
U. S. PATENTS
2,048,578, 2,314,604 and 2,412,698

VAN DER HORST CORPORATION • OLEAN, N. Y.

A PIN TURNING MACHINE that revolves AROUND the WORK?

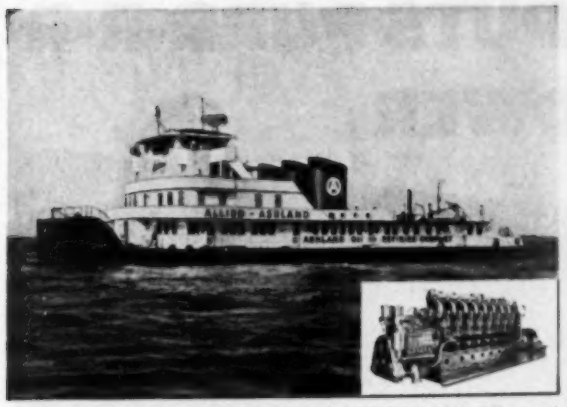
This one does at ERIE FORGE— to achieve MAXIMUM accuracy!



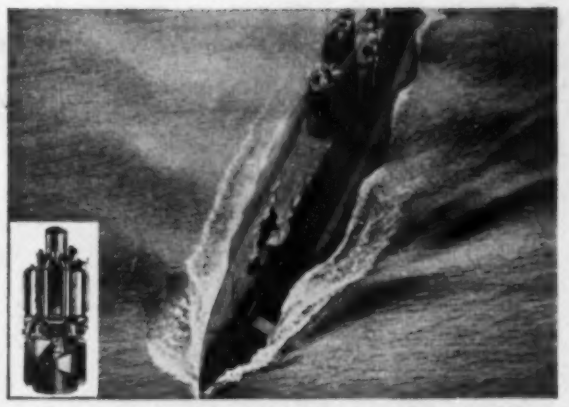


AT ERIE FORGE & STEEL CORPORATION you'll find the most accurate pin turning machine in the country. The crankshaft is held motionless . . . the machine revolves around the work! The crankshaft is accurately aligned, then bolted down . . . it cannot move off center! As this 50,000 pound crankshaft is automatically moved, from throw to throw, through the machine opening, it is finish turned to close tolerances and a mirror finish. This exceptional degree of accuracy is standard practice at Erie Forge & Steel Corporation. Every operation—from ingot to finished crankshaft—is under one control, one responsibility. Consult with us on your next requirements involving crankshafts, connecting rods or allied items.

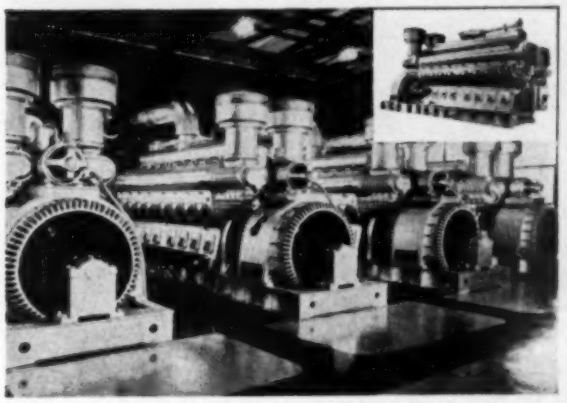
ERIE FORGE & STEEL CORPORATION
ERIE, PENNSYLVANIA



One of the most powerful river towboats is the "Allied Ashland," owned by the Ashland Oil and Refining Company. This towboat moves heavily laden oil barges from Baton Rouge, Louisiana, to Ashland, Kentucky, and is powered with three General Motors marine Diesel engines.



Developed by Cleveland Diesel Engine Division of General Motors for U. S. Navy submarines' propulsion, this new 16-cylinder, 2-cycle vertical Diesel is the lightest Diesel engine available in its power range. Its compactness is evidenced by the fact that it is only about one-third the weight and size of engines previously used for this service.



Four General Motors Diesel engine generator sets installed in Tucson, Arizona, by the Tucson Gas, Electric Light and Power Company supply peak loads and emergency power.

Erie Railroad's tug "Horneil" is typical of many General Motors Diesel-Electric Drive tugs operating in harbors throughout the world.

DEPENDABLE DIESEL POWER

FOR MARINE AND UTILITIES

Cleveland Diesel engines—first in their class—are supplying the power for America's most modern commercial work boats, utility power plant operations and the Armed Services. Continued preference by the world's largest users of Diesel engines speaks volumes for the dependability and faithful performance of these engines.

CLEVELAND DIESEL ENGINE DIVISION

GENERAL MOTORS • CLEVELAND 11, OHIO

GM GENERAL MOTORS DIESEL POWER

ENGINES FROM 150 TO 2000 H.P.

Sales and Service Offices: Cambridge, Mass. • Jacksonville, Fla. • Miami, Fla. • Montreal, P. Q. • New Orleans, La. • New York, N. Y. • Norfolk, Va. Orange, Texas • San Francisco, Calif. • Seattle, Wash. • St. Louis, Mo. • Tampa, Fla. • Toronto, Ont. • Vancouver, B. C. • Washington, D. C. • Wilmington, Calif.

STOPS SHAKES...PUTS PURR-R-R IN POWER

PENFLEX TUBING
TAMES POWER THROB... OPERATION COOLER

When two large diesels roar into action, there can be plenty of vibration transmitted to all points. This was true on one installation . . . engine vibration created a regular power throb.

The answer was found in a length of Penflex four wall interlocked air jacketed exhaust tubing on each exhaust. The flexibility of the tubing absorbed the vibration . . . put a purr in power. At the same time it achieved a circulation of air and efficient cooling action . . . prevented breakage due to thermal expansion.

Whether your problem is vibration of exhaust lines or air lines . . . the transmission of liquids, volatiles, granular material or coarse abrasive products, Penflex engineers will be glad to work with you in the application of tubing from ⅛" I.D. on up. Penflex also manufactures barrel fillers, pneumatic rivet passers and a complete line of accessories and fittings.

Get your copy of this folder on "Flexineering."

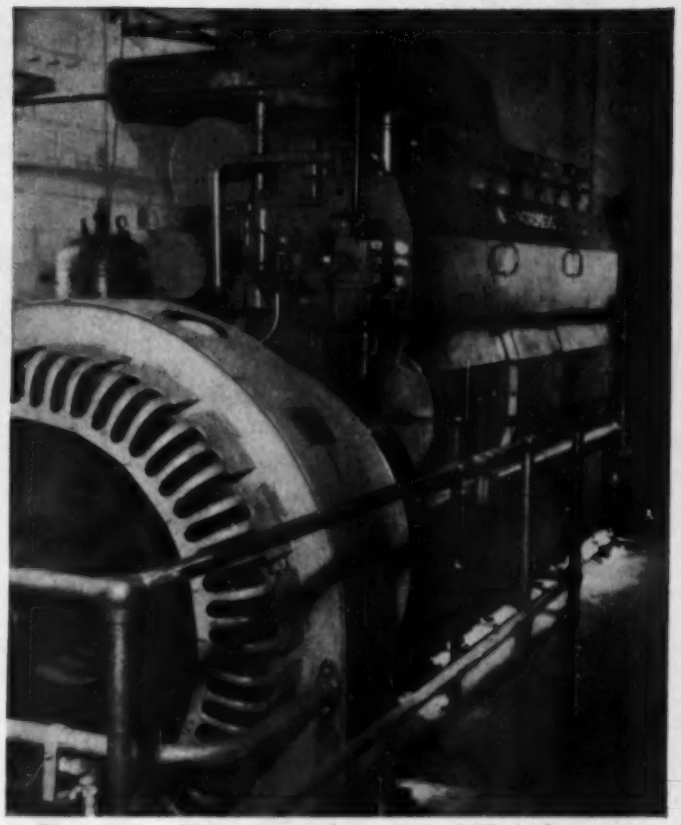
Pennsylvania Flexible Metallic Tubing Company, Inc., 7212 Powers Lane, Phila. 42, Pa.
Branch Sales Offices: Boston • New York • Chicago • Houston • Cleveland • Los Angeles

PENFLEX
HEART OF INDUSTRY'S LIFE LINES

MORE POWER AT 50% LESS OPERATING COST

NORDBERG DUAFUEL® ENGINE increases capacity and stabilizes scrap yard operations

Your power problems may not involve electromagnets—but remember there are Nordberg Diesel, Duafuel® and Spark-Fired Gas engines built in sizes up to more than 10,000 hp—to meet practically every power requirement. Write for details, outlining your power needs.



Ever watch a lifting magnet in operation? Their fluctuating operation—from *no* load to *full* load in a matter of seconds, calls for a steady, reliable source of power—power that can stand the gaff of this kind of "up-and-down" service . . . *the kind of power you get with Nordberg Duafuel® engines.*

For proof, ask Consumers Steel & Supply Company, operators of one of the largest scrap yards in the Midwest. Here's what they did . . . to avoid expensive plant outages and provide more efficient, lower cost power generation, this progressive company installed a 530 hp Nordberg supercharged Duafuel Diesel engine driving a 320 kw generator. This single Nordberg engine took over the plant's power demand from three 66 kw high speed Diesel units. *The results:*

(1) Generating costs cut almost 50%; (2) Immediate response to changing load conditions; (3) Ability to operate balers, shears and cranes and magnets at full capacity—16 hours a day, 6 days a week; (4) Sufficient reserve for plant expansion.

Although of Duafuel design, the Nordberg engine is now operating on straight Diesel fuel. Further economies will be realized when gas availability will allow full Duafuel operation.

Nordberg Mfg. Co., Milwaukee, Wisconsin

NORDBERG

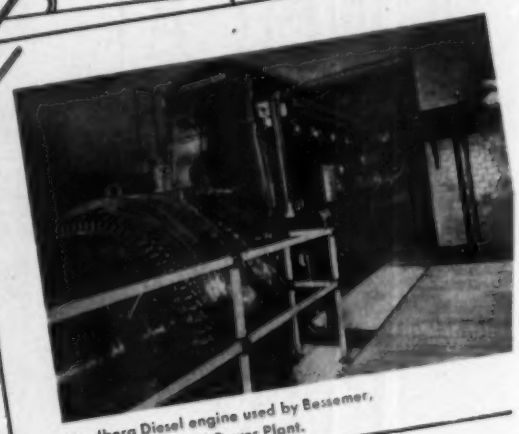
DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

Builders of America's Largest Line of Heavy-Duty Diesels

P153

*Could you make this report about your diesel engine?**

CITY OF BESSEMER, MICHIGAN REPORTS:



Nordberg Diesel engine used by Bessemer, Michigan Municipal Power Plant.

PISTONS PULLED AT 24,600 HOURS!

- All rings were free
- No carbon in ring grooves
- All original rings replaced in original grooves
- Rings should last at least 10,000 more hours
- Maximum cylinder wear was .004 at top, .002 at bottom

EXCELLENT

OIL CHANGE AT 5000 HOURS!

- No oil added to crankcase between changes
- Power cylinders fed at rate of 5 drops per minute
- Main bearing, rod bearings show very little wear
- Average K.W. per gallon of fuel is 13.5 @ 60% load factor

Sam Falember

Superintendent,
Bessemer Light Utility.

Note:

FOR TOP ENGINE EFFICIENCY, BESSEMER RELIES ON:

Cities Service DC-930 Oil used for crankcase lubrication!

Cities Service DC-230 Oil used for power cylinder lubrication!

* Why not contact your nearest Cities Service Representative or write Cities Service Oil Company, Dept. C8, Sixty Wall Tower, New York City 5, New York.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

DIESEL and GAS ENGINE PROGRESS

IN INDUSTRY · IN TRANSPORTATION · ON THE SEA · IN THE AIR

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Pranz & Wisler, Peterbilt 380 horsepower Cummins, taken south of Fortuna, California.

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would the feeble light of a match replace it?

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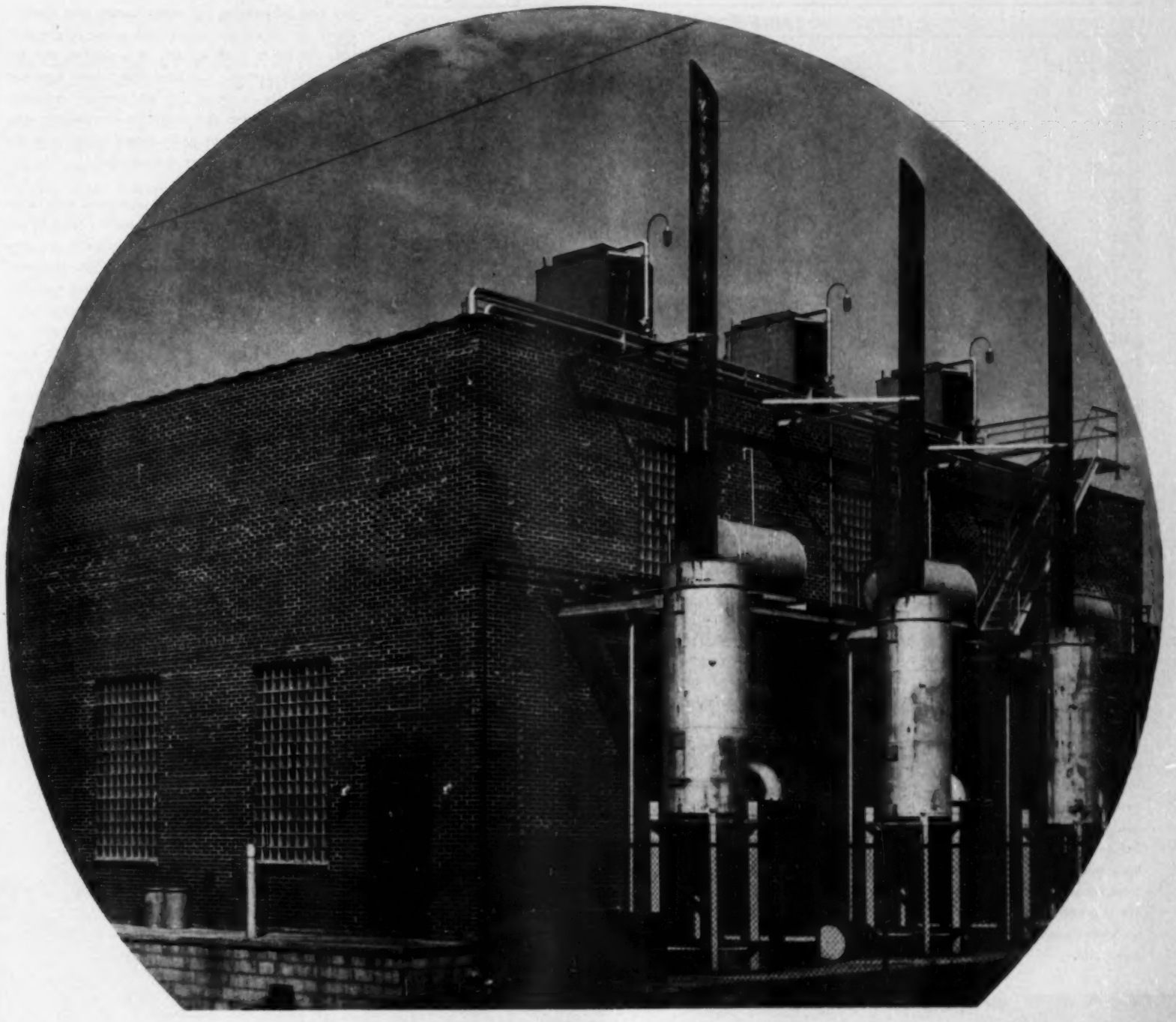


View of the rear of the Bellefontaine plant showing the Marley Aqua-Towers on the roof, day tanks next below, Maxim exhaust silencers and the Air-Maze intake filters.

BELLEFONTAINE, OHIO

By WILBUR W. YOUNG

THE City of Bellefontaine, Ohio believes in municipal utilities, having owned and operated its Gas, Water, Electric and sanitary sewer disposal works progressively as these services have been added since its first Gas Works was started in 1889. Following the long-standing policy of publicly-owned utilities, the city experienced its biggest single year of expansion during 1951 when nearly $125,000 was ploughed back into capital improvements in addition to a half million dollar electric plant financed through revenue bonds and construction started.

The new electric plant went into service April 5, 1952 with three dual fuel diesels and generators since when it has been regularly paralleling the main 12,150 kw. steam powered generating plant.

At the close of the year 1951, Chief Utilities Engineer F. M. Baxley rendered his 31st annual report from which the following excerpts reveal the consistent growth and successful operation of the Electric Utility and the reason for the addition of the new generating facilities:

TABLE I

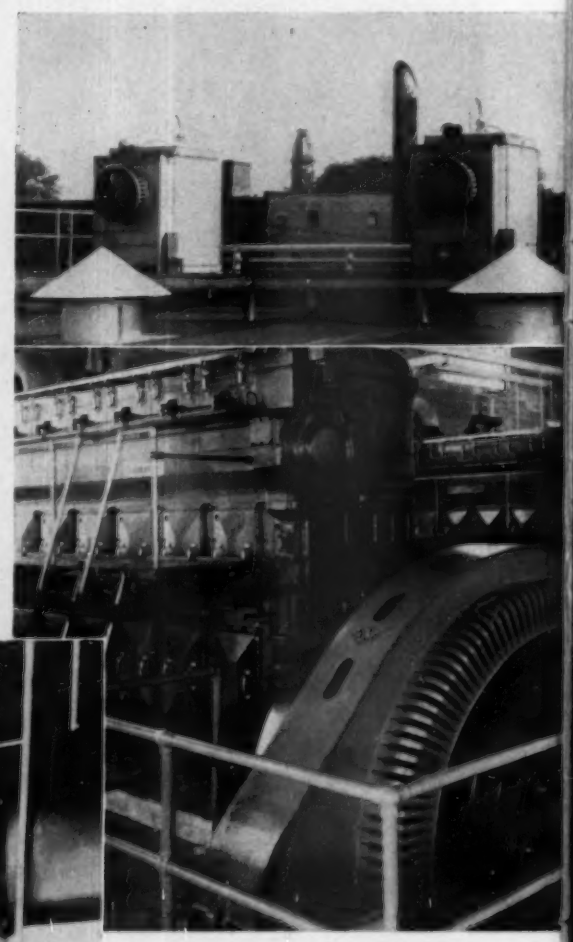
Year	Rate per kwh. Max.	Min.	Peak Load	Kilowatt Production	Operating Cost	Income
1921	10c	6c	550 kw.	1,606,542	$ 94,318.90	$101,408.83
1923	8c	3½c	950 kw.	2,631,378	85,142.25	119,690.20
1925	7½c	3c	1100 kw.	2,986,160	94,634.83	125,438.14
1928	6¼c	2½c	1400 kw.	4,257,849	86,443.66	140,948.81
1930	5½c	1¾c	1350 kw.	5,230,310	98,438.23	139,618.05
1932	5c	1½c	1425 kw.	5,348,490	93,084.89	131,080.82
1935	4½c	1¼c	1550 kw.	5,907,500	81,175.29	128,441.87
1938	4c	1c	2200 kw.	8,148,900	93,401.05	155,499.97
1940	4c	1c	2250 kw.	9,802,000	105,095.65	186,485.40
1941	3½c	8c	2850 kw.	10,872,000	116,762.20	189,796.63
1942	3½c	8c	2900 kw.	11,693,000	139,083.93	195,485.22
1943	3½c	8c	3000 kw.	12,312,000	124,477.95	202,833.93
1944	3½c	8c	3250 kw.	13,993,000	144,963.95	217,572.99
1945	3½c	8c	3400 kw.	15,035,600	160,804.94	233,756.13
1946	3½c	8c	3800 kw.	16,410,500	210,023.13	261,854.56
1947	3½c	8c	4400 kw.	20,017,400	281,461.27	306,609.31
1948	3½c	8c	5200 kw.	22,476,330	313,699.27	326,722.20
1949	4c	1c	5550 kw.	24,080,000	319,009.73	384,452.85
1950	4c	1c	6400 kw.	28,321,000	405,100.19	446,990.35
1951	4c	1c	6800 kw.	32,161,000	400,489.19	490,339.82

Bellefontaine's electric plant produced 3,840,000 more kilowatts in 1951 than in 1950, the previous high year, and established a new production record of 32,161,000 kilowatts of electricity to garner a new all-time gross income of $490,399.82. The income figure for 1951 was $43,409.47 more than in 1950. Cost of operating the plant passed the $400,000 mark for the second consecutive year and was almost twice the figure of 1946. However, the cost ($400,589.19) was $4,511 less than in 1950, the all-time high. This was due to fewer improvements being made at the plant proper than in the previous year. The annual report further revealed a new peak load of 6,800 kilowatt hours was reached compared with a previous high of 6,400 the year before, and 550 kwh. in 1921, the first year of Baxley's management. The peak loads during 1952 were consistently rising. The 12 years prior to 1952 are reported consecutively in Table I along with each year since 1921 in which a power rate change was made.

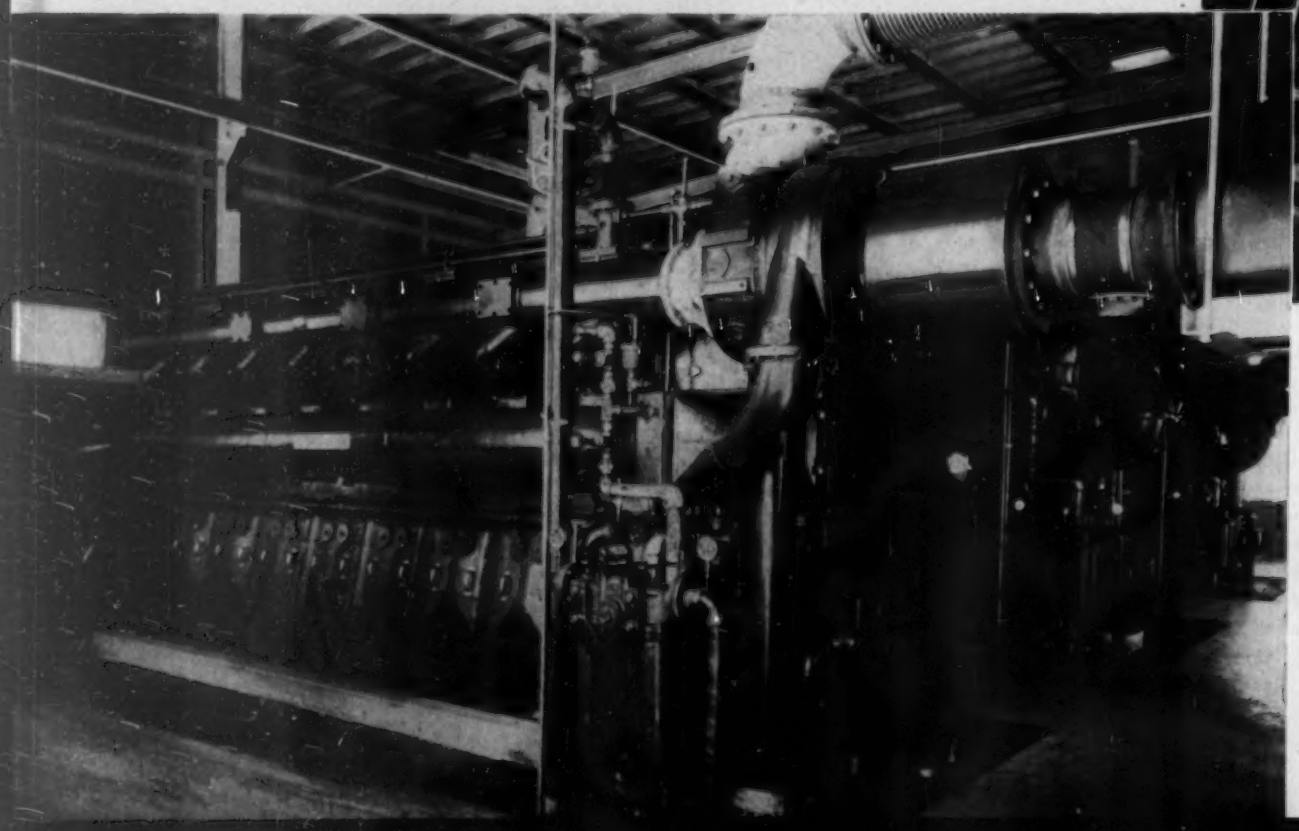
Bellefontaine looks for continued increases in both domestic and industrial demands in line with which the new electric plant reflects long range planning on the part of Mr. Baxley and the City Fathers. A separate building was erected to house the new electric plant which is a complete entity. The prime movers are three Superior, 8-cylinder, 14½ in. bore, 20 in. stroke, 4-cycle diesels, each having a supercharged rating of 1423 bhp. at 360 rpm. These are dual fuel engines operating on gas fuel during the summer months when the City's gas plant produces a surplus. The generators are three E-M, 1000 kw. direct connected machines.

Maximum dependability and employment of every modern improvement are the dominant notes in the planning of this fine plant. Duplicate pairs of jacket water pumps are installed for each engine, also provided are standby lubricating oil pumps of sufficient capacity to operate the engines in the event of engine pump failure. Each engine has two lubricating oil sump tanks, one directly above the other, the upper tank being in constant use, the lower tank serving as a reserve and for draining purposes. A rotary compressor operates automatically to boost the gas pressure when it drops below 10 psi. A separate heat exchanger connected into the engine jacket water system provides for cooling the gas after compression.

The engines are turbocharged and fitted with intercoolers. In this connection, Mr. Baxley worked out an interesting and unusual arrangement for supplying cooling water to the intercoolers. Mounted on the roof are three individual fan and radiator-type aqua towers, each handling the cooling water for its corresponding intercooler. These units are interconnected so that any one of the three aqua towers can handle any of the intercoolers. And likewise, a three-unit "Dri-Cooler" with individual pumps and controls for cooling each engine's jacket water, is installed back of the plant and extends less than half the height of the building. This is an exceptionally compact and unobtrusive unit for



Top, above: The three Marley Aqua-Towers which handle the cooling water for the intercoolers.



View of the three Superior dual fuel engines showing the Elliott super charger with the Young "Monoweld" intercooler.

this type of equipment, and since no evaporation is involved in the Dri-Cooler there is no unsightly cloud of steam issuing from this cooling unit. The entire jacket water system is interconnected so that any one of the three heat exchangers can serve any engine. Intake air for each engine is induced through a filter and silencer in tandem. This unusual arrangement was specified as extra insurance against intake frequencies and it can be said that the plant is notably silent in operation.

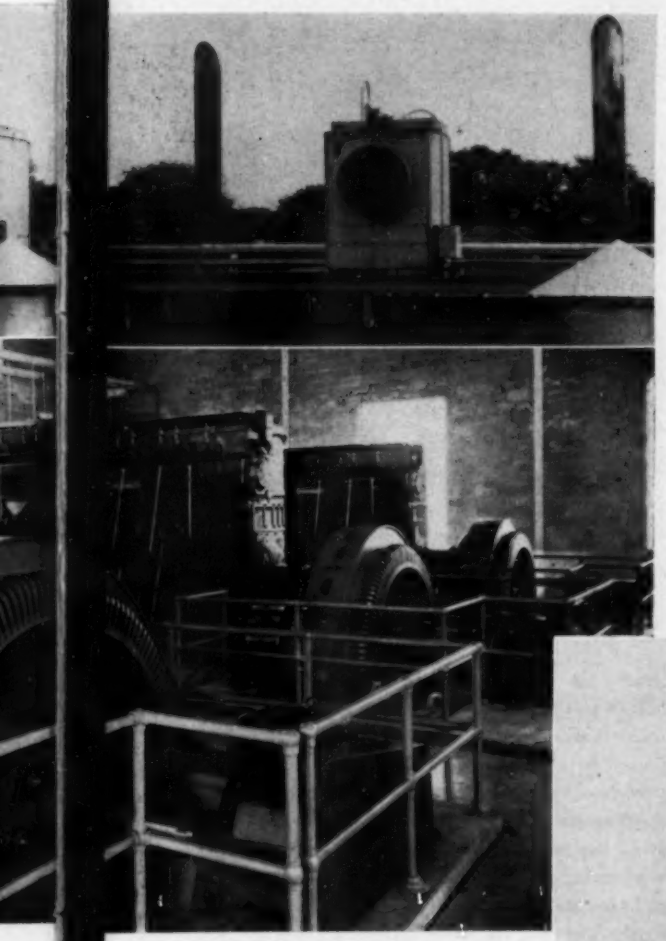
F. M. Baxley is proud of the city's electric utility and justly so. It is a smoothly working, money-making operation which showed net earnings of close to 60 thousand dollars for 1951 on gross receipts of a little over half a million. All city buildings receive electric service without charge; neither is this service credited on the accounts of the electric plant. C. R. Baxley, who is superintendent of the new electric plant, is most enthusiastic about his dual fuel diesels. He says the engines are consistently doing much better than the manufacturer's guarantee specifies.

Supt. C. R. Baxley in front of the main Electric Machinery switchboard which is fitted with Westinghouse and Electric Machinery instruments.

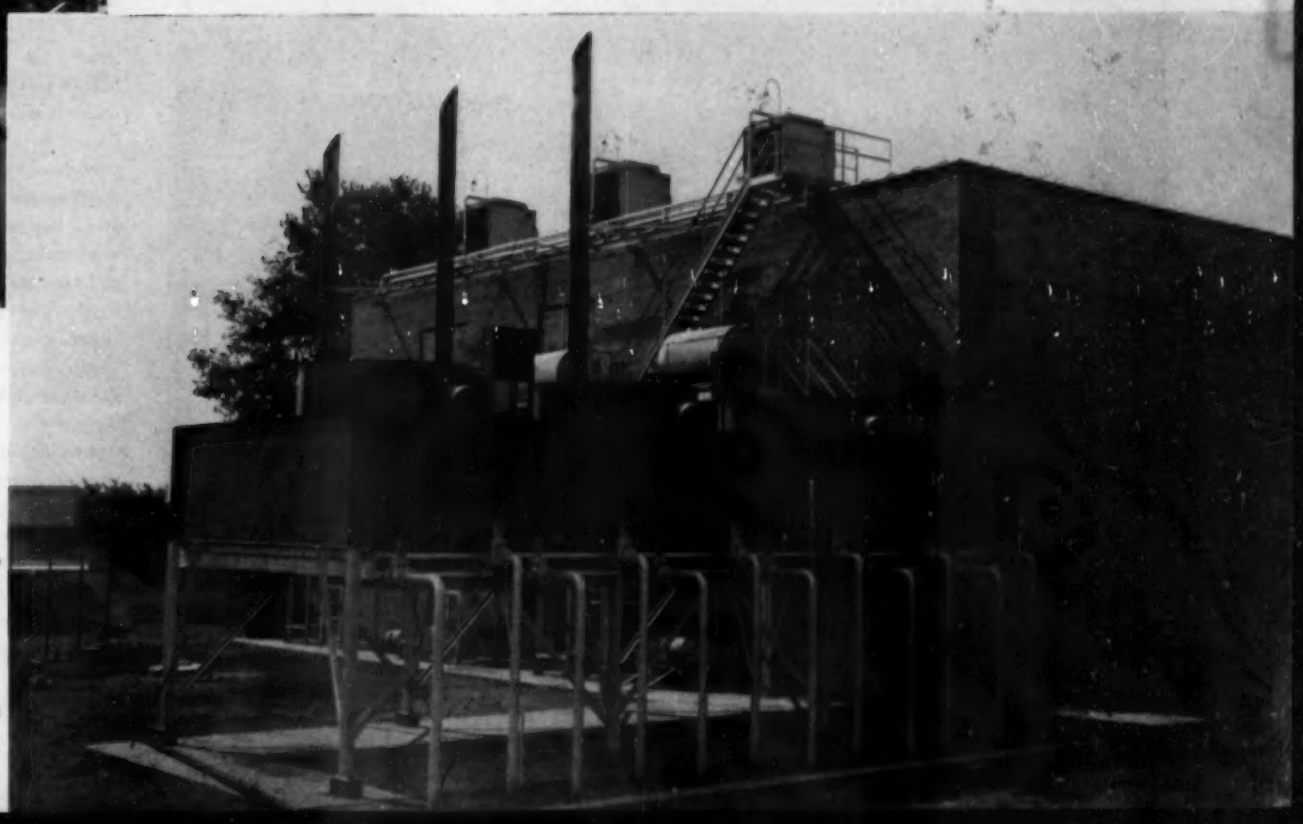
Each of the engines are fitted with a Hilco lube oil reclaimer and two lube sump pumps, also a standby lube pump.

List of Equipment

Engines—Three Superior Dual Fuel, 8-cylinder, 14½ in. bore, 20 in. stroke diesels, turbocharged, rated 1423 hp. at 360 rpm.
Generators—Electric Machinery 1000 kw. at 360 rpm., 3-phase, 60 cycle, 2400/4160 V.
Turbochargers—Elliott.
Intercoolers—Young Radiator "Monoweld."
Aquacoolers, Intercooler Cooling Water—Marley.
Dri-Cooler for Jacket Water Cooling (three unit) —Marley.
Heat Exchangers (Water and Lube Oil) —Ross.
Intake Filter-Silencers—Air-Maze Oil Bath Filter and Maxim Silencer in tandem.
Gas Coolers—Ross.
Gas Meters—Roots-Connersville.
Exhaust Silencers—Maxim.
Lube Filters—Purolator.
Lube Reclaimers—Hilliard (Hilco).
Lube Transfer Pumps—Roper.
Mechanical Lubricator (On Gas Compressor)—Manzel.
Fuel Filters—Purolator.
Fuel Injection Pumps—Scintilla.
Fuel Oil Pumps—Roper.
Jacket Water Pumps—Weinman (2 per engine).
Fuel Meters—Niagara.
Thermo-Control Valves—Fulton-Sylphon.
Governors—Woodward.
Centrifugal Speed Relay—General Electric.
Day Tank Level Gauges—Liquidometer.
Manometers—Turbocharger and Manifold Pressures—Meriam.
Pyrometers—Alnor.
Centrifugal Pumps—Circulating Water for Intercooler—Weinman.
Starting Air Compressor—Quincy.
Starting Air Bottles—Scaife.
Switchgear—Electric Machinery.
Pressure Gauges—Ashcroft.
Load-Time Recorders—Bristol.



Above: The three Superior dual fuel diesels installed in the new Bellefontaine electric plant in 1952. Note the Electric Machinery generators.



The three unit Marley Dri-Cooler handling the heat exchanger cooling water is practically concealed behind the plant. There is no evaporation and no steam.

ERIE CANAL BREAK REPAIRED

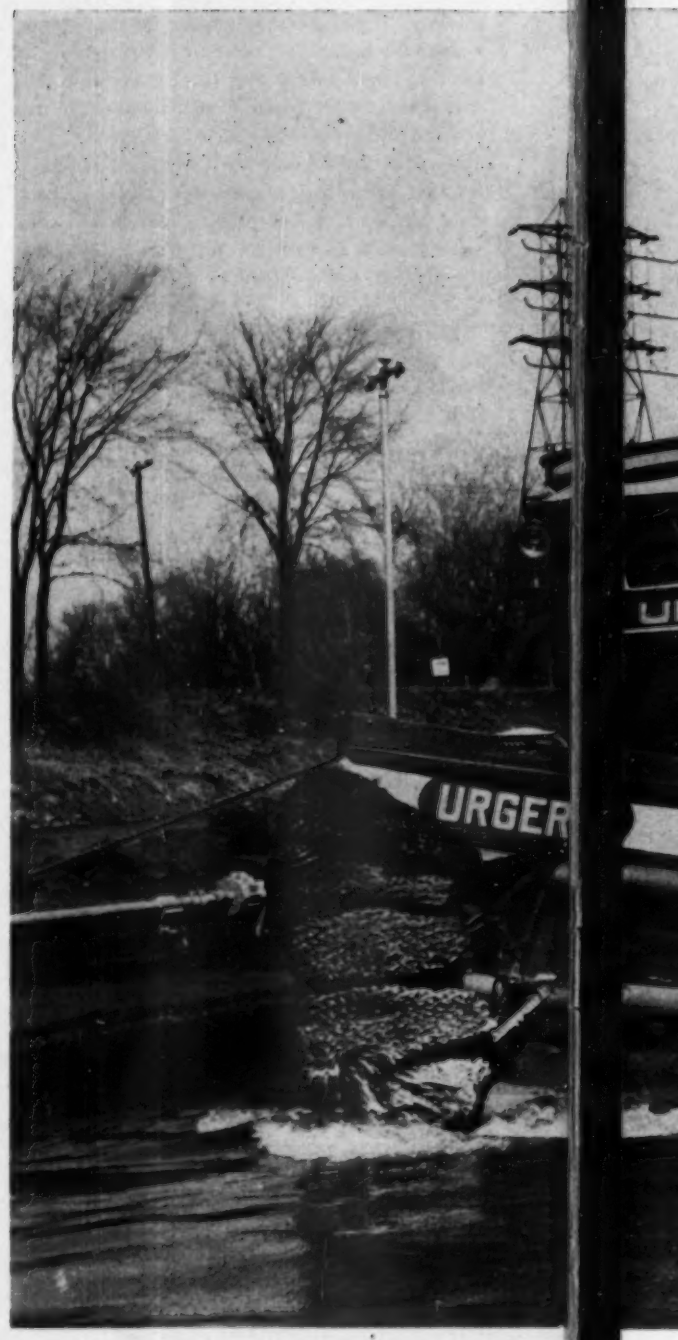
By **FRED R. LINDSEY***

THE Chief Operator at Lock Nine, Ralph Crawford, discovered a leak through the south span of the movable dam shortly after 8 a.m. on July 12, 1952 and immediately notified the Section and Albany Offices. A prompt inspection showed a boil about fifty feet in diameter and six feet in height some seventy-five feet downstream from the gates in the south span of the dam. The gates in the dam were raised at once and the upper pool drawn. This action undoubtedly saved the south abutment, the south pier, and the south and middle spans of the bridge superstructure, as the current through the break was carrying a large amount of material, including huge boulders and chunks of concrete from the apron of the dam just above the dam sill. An inspection, after the pool had been lowered, indicated that the south abutment and south pier had been undermined, but with no apparent movement, as they were supported on wooden piles. The 35 foot sheet piles at the upstream edge of the upper apron were undermined and over half of them were carried away. The fill under the upper apron and dam sill was carried away to an average depth of 35 feet, and the apron and sill were broken up and parts were carried away. The lower apron was undermined, but most of it remained in place, as it was supported on wooden piles. The line of steel sheet piling at the downstream edge of the lower apron was broken and opened up.

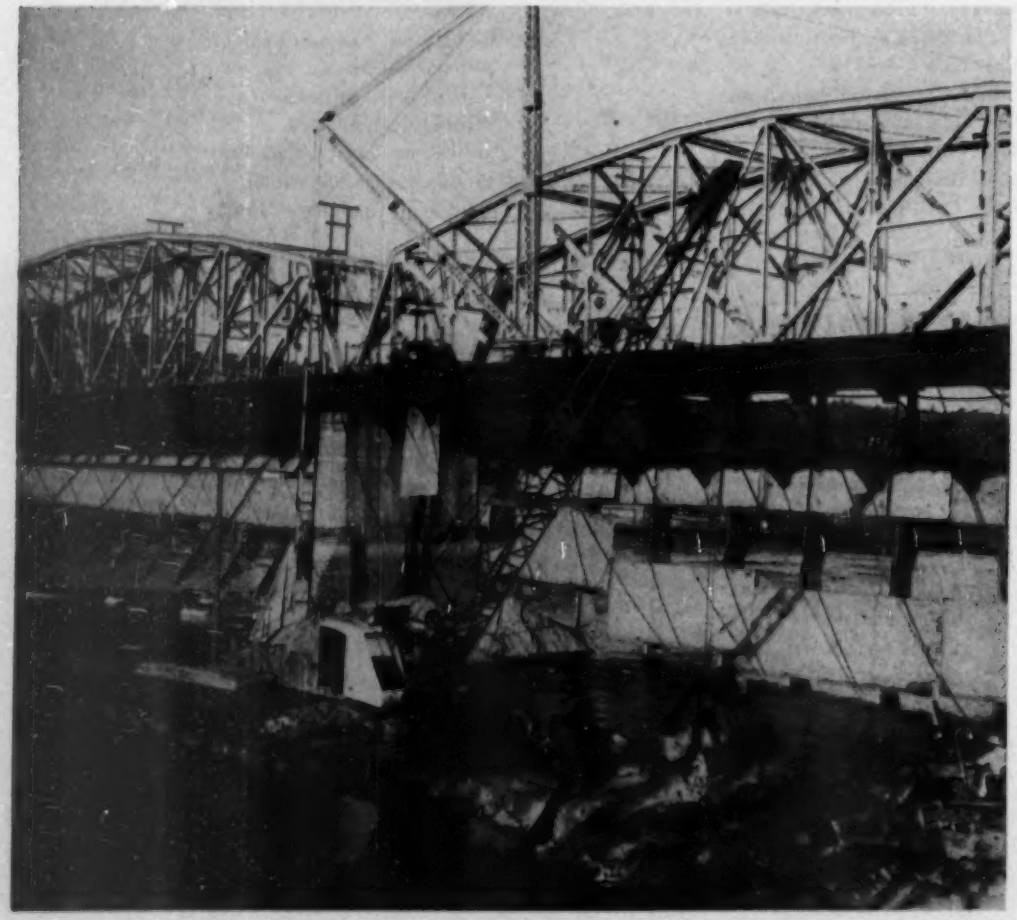
The plant equipment, personnel, and supplies of the Canal Maintenance Bureau of the Public Works Department were assembled at the lock on July 13th, and work on temporary repairs was progressed on a 24-hour daily basis until navigation was resumed on August 20th. The repairs were made by placing a cofferdam from above the south pier to the river bank about the south abutment. This cofferdam was made by driving steel sheet piling and was filled with heavy gravel and quarry stone. The cofferdam was approximately 170 feet long and 25 feet wide. The piles in the downstream side and outer end were up to 75 feet in length and those in the upstream side 40 feet. The cofferdam and bridge pier and abutment were supported by a heavy gravel fill to several feet above pool level, extending from pier to abutment and downstream from the cofferdam to several feet beyond the lower line of the piers. The cofferdam was further protected from ice damage by a deposit of heavy gravel upstream. The cofferdam was sealed to the pier and its outer corners reinforced by a liberal use of concrete. Approximately 50,000 cubic yards of ready-mix concrete, quarry stone, and gravel, and 500 tons of steel were required.

About 125 men were employed on this work and the following is a partial list of equipment used: One crane, portable on Caterpillar treads, dieselized, capacity 1½ cu. yds.; one crane, portable, mounted on Caterpillar treads gasoline engine powered, capacity ¾ cu. yd.; two cranes, truck mounted, gasoline engine powered, capacity ½ cu. yd.; one single drum hoist, gasoline engine driven

Assistant Superintendent of Operation and Maintenance, New York State Department of Public Works.



The 40 ft. steel piling in downstream row of cofferdam (later to have 35 ft. extensions welded on and driven down) and quarry stone and gravel fill used as roadway.



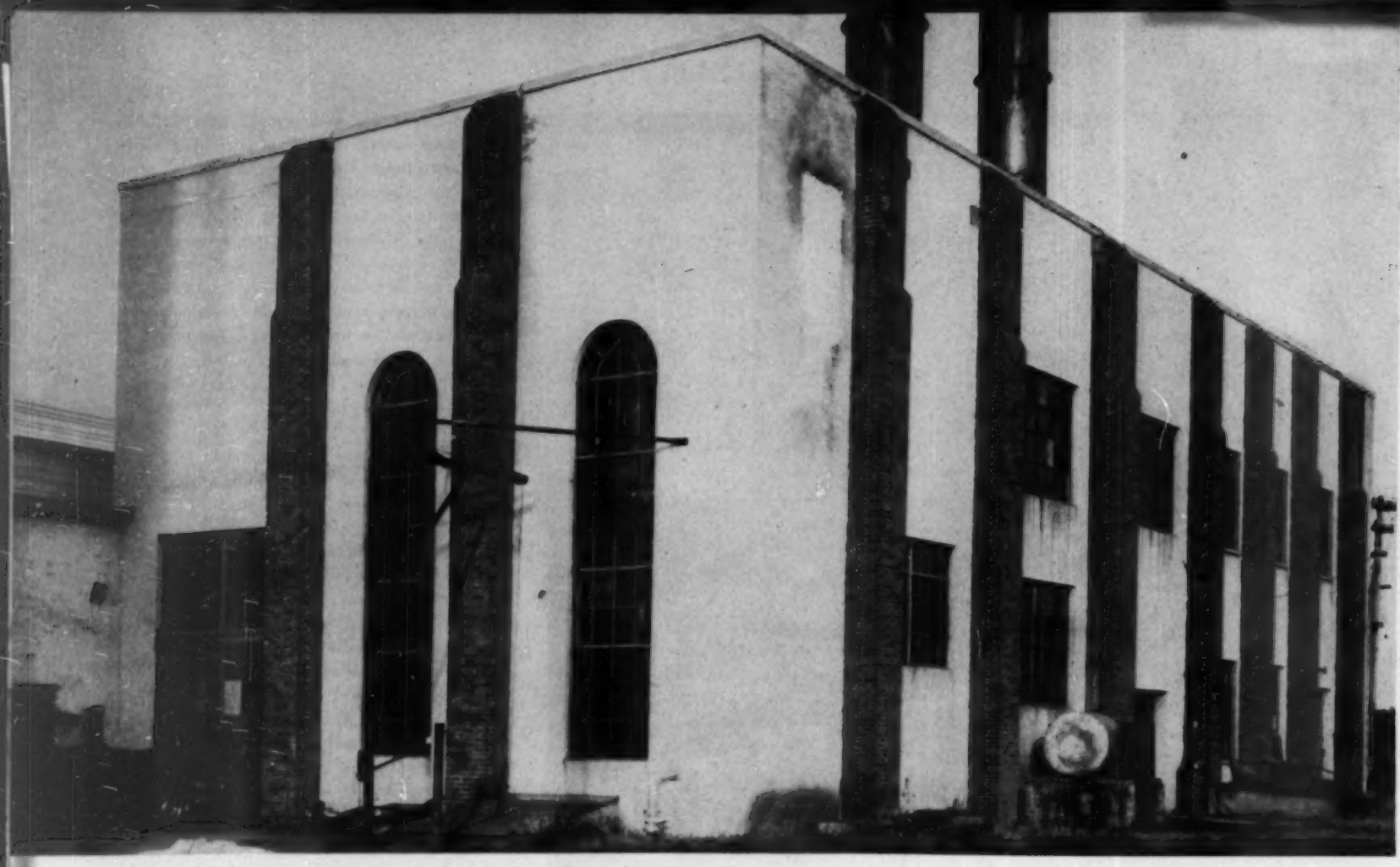
The *Urger*, one of the many National Supply Company Atlas powered tugs which operates on the New York State Erie Canal.

and one stationary crane, or guy derrick, powered with 1—3-drum hoist, air driven and 1—swinging engine, air driven. One air compressor, portable, dieselized, capacity 600 cfm.; one air compressor, portable, dieselized, capacity 500 cfm.

Also used: one air compressor, portable, gasoline engine driven, capacity 315 cfm. and one air compressor, portable, gasoline engine driven, capacity 30 cfm. Four pile driving hammers, McKiernan and Terry, sizes 5-7 and 9B; two bulldozers, Caterpillars, dieselized, sizes D-7 and D-6; five burning torches; five electric welding machines, gasoline engine powered, capacity 300 amps and six 5-ton dump trucks. One truck, stake body, capacity 5 tons; two trucks, stake body, capacity 1½ tons; one truck, dump body, capacity 2½ tons; one truck with oil tank mounted, for fuel oil delivery; one truck, pick-up; one station wagon, wagon drill and loud speaker system. One 15-in. diesel electric hydraulic dredge and equipment; one derrick boat and its crew at location of repairs and one derrick boat (small) used for light work at location. Two derrick boats, located at Amsterdam, their crews employed on pile driving at location of repairs; two tugs, towing scows of steel sheeting; three deck scows for moving steel sheeting to location of repairs; one tender or small tug attending hydraulic dredge; six 30 ton trailers and two cranes located at the Waterford Yard loading supplies and equipment for delivery to Lock 9.

Machine and carpenter shop equipment, at Waterford and Amsterdam, used for fabricating material, and miscellaneous small tools and equipment, such as chain hoists, air drills, power saws, power wrenches, etc. were employed. The New York State Waterways Association, canal operators, shippers, and pleasure boat operators were all very cooperative and considerate during the time navigation was suspended, although it imposed serious financial loss and inconvenience on all. This break has caused a loss in tonnage on the canal for the season of over one half million tons. Engineering studies and plans are now being made for permanent repairs. It is expected that the cost of permanent repairs will be about one million dollars. The cost of temporary repairs was approximately one hundred ten thousand dollars.

Finishing the hydraulic fill in the cofferdam, showing the upper row of tie rods. The upper pool was being filled when this picture was taken.



DAVID CITY, NEBRASKA

One 1440-Hp. Worthington Carries 96 Percent Of Load at David City, Nebraska, Plant; Saves $14,400 in First Full Year

By DOUGLAS SHEARING

ONE Worthington dual fuel engine is in virtually continuous operation in the David City, Nebraska, municipal power plant and currently is supplying more than 96 percent of the city's total electricity requirements. Taking over the load from a steam turbine, the engine cut fuel costs more than $14,400 in its first full year of operation, a cost reduction of better than 50 percent. David City is a community of 2,300 population, county seat of agricultural Butler County. The city has been producing electric power since 1916 when it took over a privately-owned 80 kw. steam plant. After a brief experiment with oil engines, the city reverted to steam with the installation in 1922 of a 250-kw. steam engine. Then, in 1929, a 625-kw. steam turbine and a 250-hp. boiler were acquired. A second boiler of the same rating went in ten years later. In recent years, David City has been faced with the problem of rising costs of fuel, labor and other elements of operating expense. In 1948, some economies were effected by equipping one boiler to burn natural gas instead of coal. Still the growing expenditures threatened to outstrip income. It was decided that new, modern, economical generating facilities were the best means of combatting the inflationary trend and so, in August, 1949, the city put into operation a Model SEHGO-7, 4-cycle, supercharged Worthington dual-fuel engine. This 7-cylinder unit of 16-in. bore and 20-in. stroke is rated at 1,440 hp. at 360 rpm. at David City's altitude.

The effect of the new engine can be seen clearly in the statistics on five fiscal years.

Yr. End Apr. 30	Kw.Hr. Gen.	Cost Fuel	Cost Fuel Per Kw.Hr.
1947	2,291,590	$27,023	$0.01179
1948	2,448,550	33,918	0.01383
1949	2,741,100	26,267	0.00958
1950	2,984,230	19,743	0.00661
1951	2,988,300	14,210	0.00475

The year ending April 30, 1947, with steam turbine and coal-burning boilers, fuel costs per kwh. reached a peak of 11.79 mills. In 1949, with one boiler burning natural gas, costs were cut to 9.58 mills. For 1950, the dual-fuel engine served part of the year, cutting the fuel bill to 6.61 mills per kwh. Finally, in the fiscal year 1951, the engine operated the full year and slashed fuel costs for the plant to 4.75 mills per kwh. Compared with 1949, the last full year before installation of the new engine, this meant a saving of 4.83 mills per kwh. At this rate, fuel costs for 1951 were cut $14,433.49. To accomplish this saving, the dual-fuel engine ran 7,184 hours and generated 2,442,800 kwh. In the same period, the turbine ran 1,576 hours and produced 545,500 kwh. Even this heavy dependence on the new engine was exceeded the next year. In the first six months of the 1951-52 fiscal year, the dual-fuel unit carried the load for 4,267 hours, actually 96.6 percent of the elapsed time. In that six-month period, the engine pro-

duced 1,490,300 kwh., which was 96.2 percent of total plant production. The steam turbine ran just 149 hours, producing 58,700 kwh. For the half year, the dual-fuel engine consumed natural gas costing $4,530.89 and fuel oil costing $1,407.68.

Here is the picture of fuel costs per kwh.

Natural gas .....3.04 mills per kwh.
Fuel oil .....0.94 mills per kwh.
Total fuel cost .....3.98 mills per kwh.

Total plant average was down to 4.17 mills per kwh.

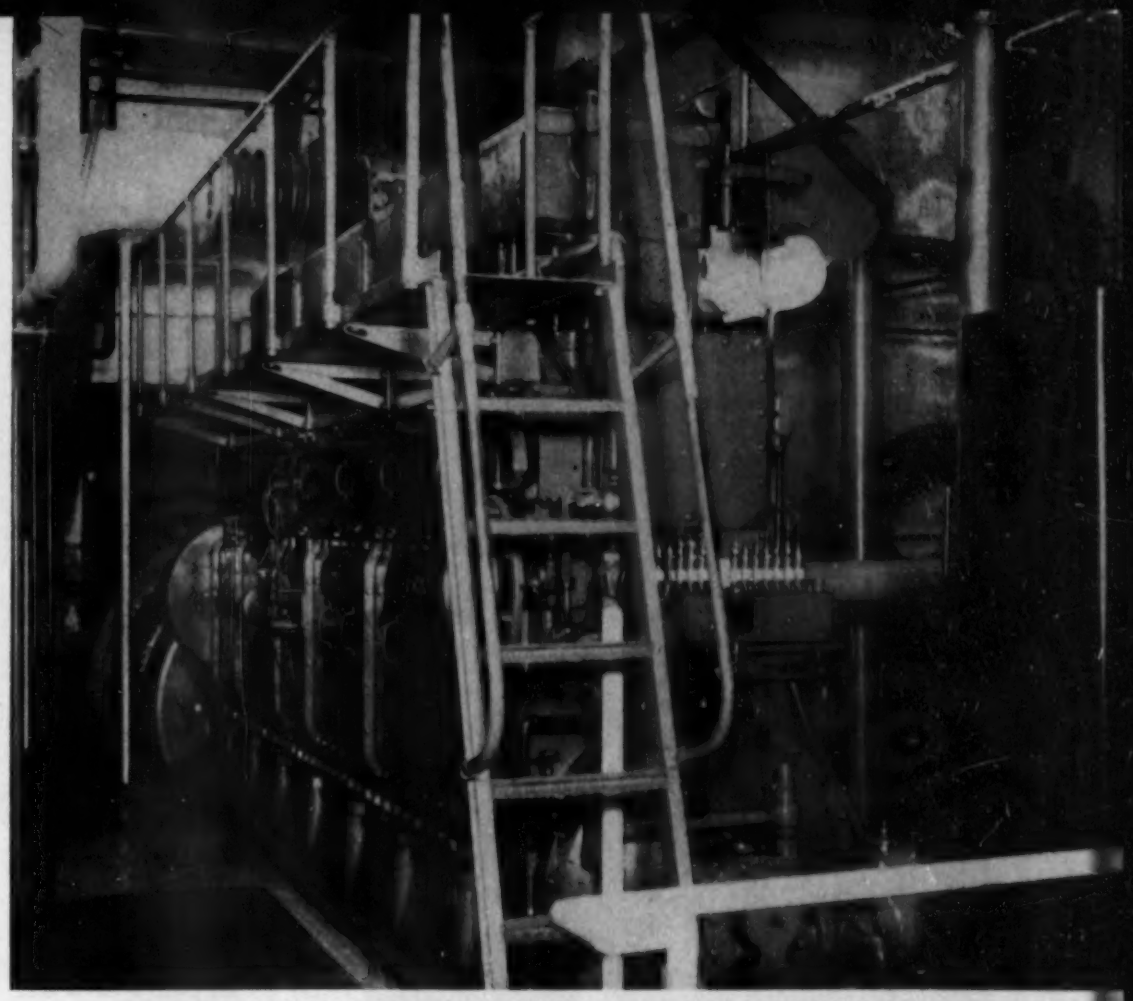
According to Light and Water Commissioner L. J. Reinhardt, the dual-fuel engine runs continuously and carries the entire load except when shut down briefly for normal preventive maintenance. It is the practice to run the steam turbine once every three weeks while operators inspect the Worthington engine. Continuous operations means that the dual-fuel unit must carry a varying load. Chief Engineer J. H. Shafer reports that load runs from a 200 kw. valley to a 700 kw. peak. A glance at the figures on engine hours and kwh. generation shows that the 1,440-hp. unit was called on for an average hourly production of just 349 kwh. Obviously this light load does not permit maximum engine efficiency and makes even more impressive the fuel economies achieved.

In plant design, the dual-fuel engine was carefully integrated with the existing steam equipment. For example, engine exhaust gases which drive the engine's turbocharger then pass through a waste heat boiler. This provides 5 to 10 lb. of steam which is used to keep boiler feed water hot and cut the time required to start the turbine. The engine has a separate closed cooling water circuit but the raw water system serves both diesel and steam units. A centrifugal pump driven by a 10-hp. motor circulates soft water through the engine jackets and a heat exchanger. A second identical pump serves as a standby. There are three motor-driven centrifugals to pump raw water through the exchanger and an induced draft cooling tower. One pump is adequate to handle the dual-fuel unit but all three are employed when the turbine operates. Jacket water makeup is treated in a zeolite-type softener.

Lubricating oil is circulated to bearings and into the pistons by an engine-driven pump. There is an oil cooler with automatic thermostatic bypass valve in this circuit. Some oil is drawn continuously from this pressure system and cleaned in a Fuller's earth filter. Engine cylinders are supplied with oil by force-feed mechanical lubricators. To insure the proper air-fuel ratio, intake of filtered air to the engine is controlled automatically to match the varying load as indicated by exhaust temperature.

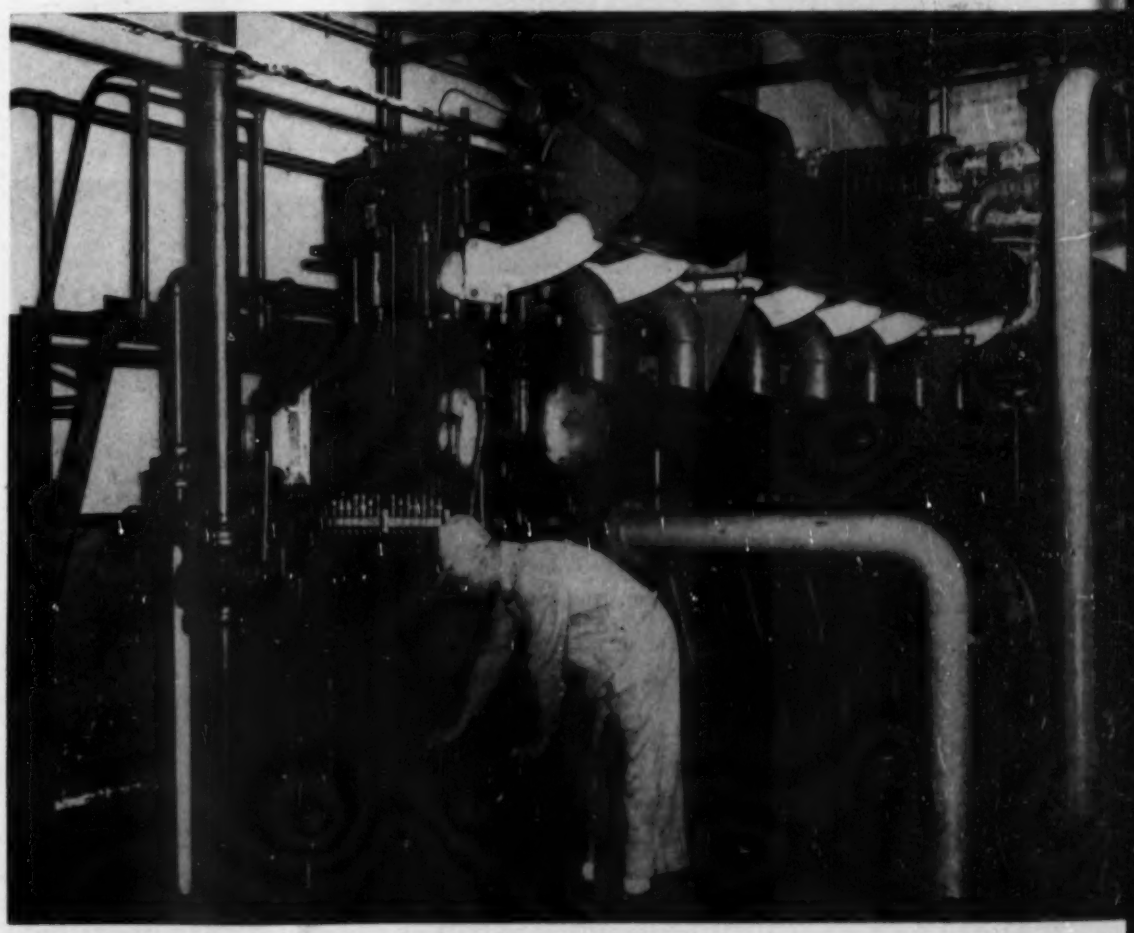
The dual-fuel engine uses natural gas at 12 psi. as its principal fuel. A small constant charge of fuel oil is injected to ignite the gas. For 100% oil operation, there is an individual pump for each cylinder.

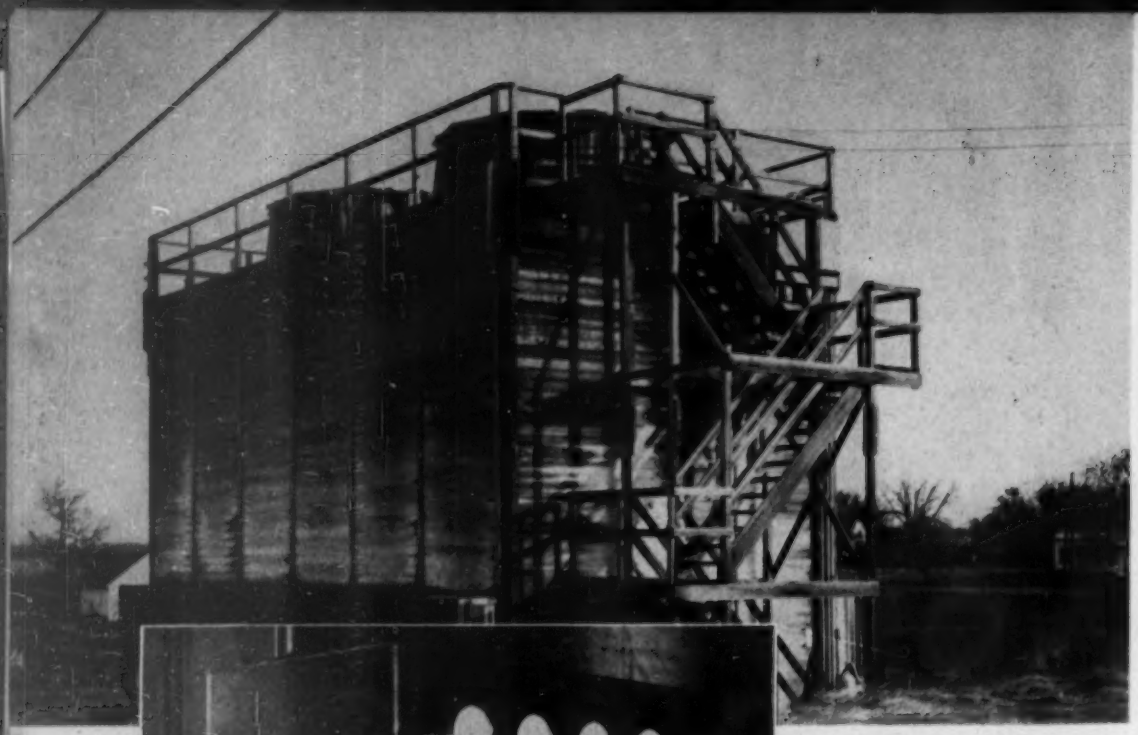
If gas pressure fails, the engine switches instantly to full oil operation and the governor, which had been regulating gas consumption, controls the quantity of oil injected. Mr. Shafer reports that



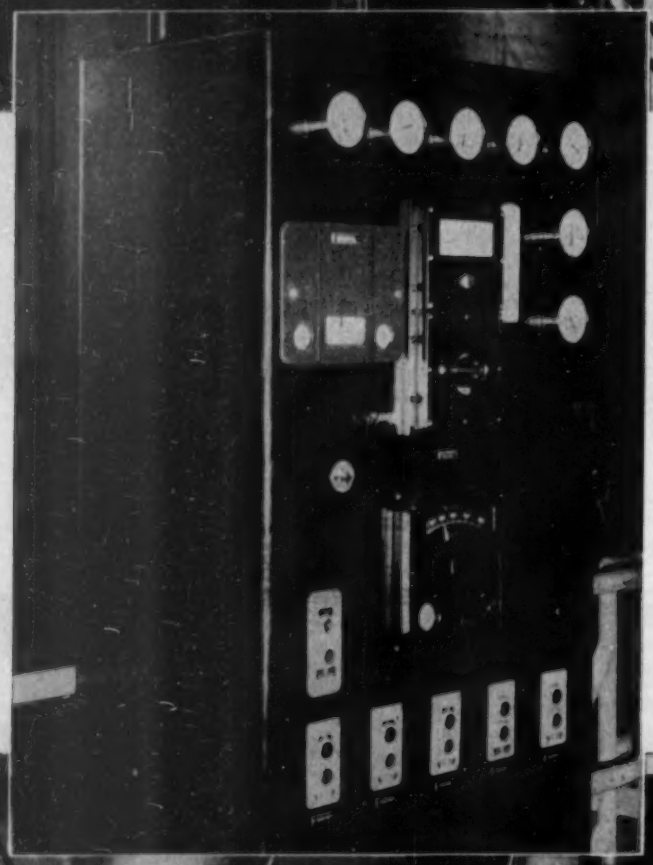
Note the Manzel lubricators in foreground and the GE generator in the back in this view of the 1,440 hp. Worthington dual-fuel engine.

The 1,440 hp. Worthington dual-fuel engine is in operation more than 96% of the time. Visible in this view are the GE generator, Elliott supercharger, Manzel cylinder lubricators and Cuno fuel oil filter.

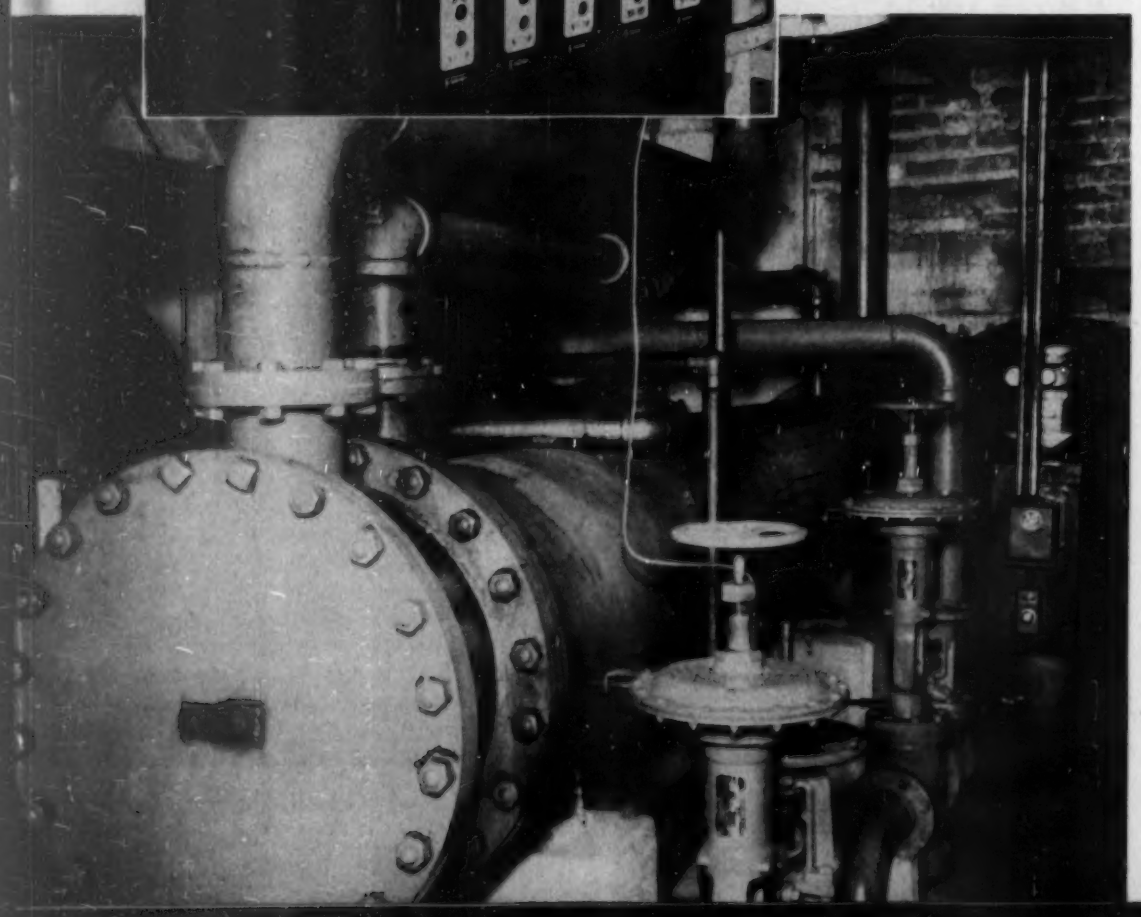




Cooling water for both the steam plant and dual-fuel unit is handled by this Pritchard induced draft cooling tower.



Located near the engine is this B. & L. Specialties Co. gauge board with Alnor pyrometer, Bristol air intake regulator, Taylor temperature regulator and Marsh gauges.



the engine uses 45 gal. of pilot oil in 24 hours of dual-fuel operation. As a full diesel, the unit produces between 13 and 14 kwh. per gal. of fuel oil consumed.

In the years just prior to installation of the dual-fuel engine, David City's electric utility was in precarious financial condition. In a report submitted in 1951 by Black & Veatch, the consulting engineers said: "If it had not been for this improvement (installation of the dual-fuel engine), the department would not have been able to have absorbed its increased fixed charges to date without added revenues which could have been secured only by an increase in rates to the customers." In the year ending April 30, 1951, the department was clearly in sound condition.

Electrical Earnings		$87,431.89
Production Costs	$34,735.10	
Distribution Costs	10,541.63	
Commercial Costs	1,853.13	
General and Misc.	2,599.99	
City Hall Building	1,138.53	
Total Operating Costs	$50,868.38	
Depreciation	16,734.42	67,602.80
Net Operating Profit		$19,829.09

As the load and production increase, reducing the unit cost of overhead and improving operating efficiency, David City can look forward to continuing and growing profits. Plant operations are directed by Commissioner Reinhardt under the supervision of Mayor Earl Tilma and the Light and Water Committee of the Council, Richard Zeilinger, chairman, Roy Welte and Kenneth Nixon.

List of Equipment

Engine—One 1,440-hp., 7-cylinder, 16 x 20-in., Model SEHGO-7 supercharged dual-fuel engine operating at 360 rpm. Worthington.
Generator—One 1250 kva., 1000 kw., 360 rpm., 80% pf., 3-phase, 60-cycle, 4160/2400 volt generator with 15 kw. shunt wound exciter. General Electric Company.
Supercharger—Elliott-Buchi.
Governor—Woodward.
Injection pumps—American Bosch.
Pilot oil—Phillips Petroleum.
Fuel oil filter—Cuno.
Gas meter—Emco. Rockwell.
Lube oil—Vacme No. 3. Socony-Vacuum.
Cylinder lubricators—Manzel.
Lube filter—U. S. Hoffman.
Oil cooler—Sims.
Heat exchanger—Graham.
Induced draft cooling tower—J. F. Pritchard.
Air filters—American Air Filter.
Waste heat boiler—Foster Wheeler.
Pyrometer—Alnor.

Lubricating oil for the Worthington engine is cooled in a Sims oil cooler and cleaned in a U. S. Hoffman filter.

CALIFORNIA COTTON CONFERENCE

by - E. Hal Higgins

A few of the 30 International Harvester cotton pickers contributed for the day by the owners in the cause of building a hall for the Veterans of Foreign Wars in the town of San Joaquin. The total donation from the day's pick brought in close to $30,000.

1952 Crop Hits 1,900,000 Bales from 1,399,000 Acres That Bring the Value to $400,000,000 for Smartly Managed Skilled Labor

IT'S an old story to say that farming is Big Business in California. Farm editors have been using that statement until it is threadbare after a couple of wars and the ups and downs that go with them. But last year the National Cotton Council of America held its sixth annual Belt-wide Cotton Mechanization Conference right in the heart of California's cotton belt. This permitted the cotton producing industry of the rest of the U. S. to get an eyeful of what's going on in cotton out here where all cotton is irrigated and farmed in mass production, yielding high returns on investments in land, fertilizer, machines and labor. So, your Old Reporter went up to Bakersfield and Shafter, where two days of the 3-day meetings were held, to have a look at the gathering of men from the Deep South who have been growing cotton since long before their grandpappies fit the damyankees from up no'th. For cotton is still King down South, and has never lost its crown to another crop since the pioneer settlers broke up the land and began farming with slave labor.

The program was nicely balanced among the agricultural college, the U. S. Department of Agriculture, the farm organizations, and the Farm Equipment Institute (the industry's national association of manufacturers). The quake-scarred streets of Bakersfield are still a potent reminder that Nature can and does take a hand in the games of men out here in California, though repair crews were seen working rapidly to heal the wounds of the recent motherly shake-down. The old Karpe's building in which the International Harvester Company's dealer was housed had been completely shaken down and the debris removed to make way for a new modern, half-block building. This will house the store while the temporary offices in the warehouse and service building keep the organization perking.

"There were over 5,000 International Harvester cotton pickers at work on the record crop this past fall," an International engineer told the writer. Allis-Chalmers, John Deere and Rust have more than a thousand more, the Deere and Allis-Chalmers pickers being 2-row jobs that cost around $12,000 to $14,000 each. J. I. Case is coming along with a picker that is expected to appear at the field demonstration at Shafter but, like the International 2-row job being developed to meet the demands of the bigger growers, it was decided by the top brass of these companies not to make a public demonstration yet. The International pick-

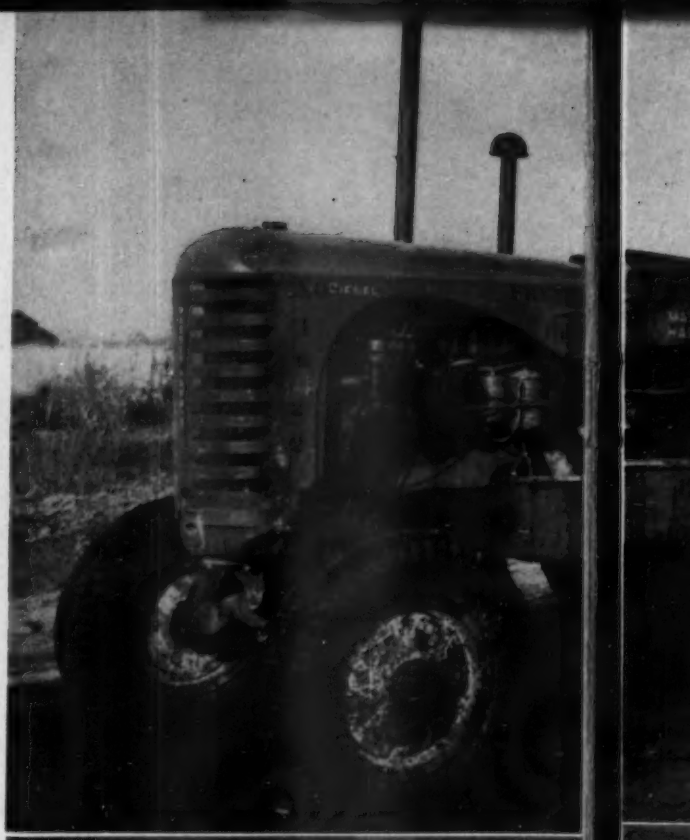
The MRS wheel diesel at work moving dirt on a big land leveling contract for more cotton land on the San Joaquin West side. The MRS is powered by a Cummins NHBI-600, 4-cycle diesel. It has five speeds forward and one reverse.

ers are mounted on the regular farmall wheel tractors for picking season, the tractor operating backward. About half of these farmalls are diesels—MD models. More would be of this type were the factory able to turn out more diesel wheel jobs to meet the demands of the cotton men. In this year the swing of California farmers to diesels on new orders, should go up to 90% or more, say dealers in the West Side cotton area. For this cotton land is all-diesel territory in the matter of heavy crawlers and many wheel tractors, irrigation engines and long-haul heavy trucks.

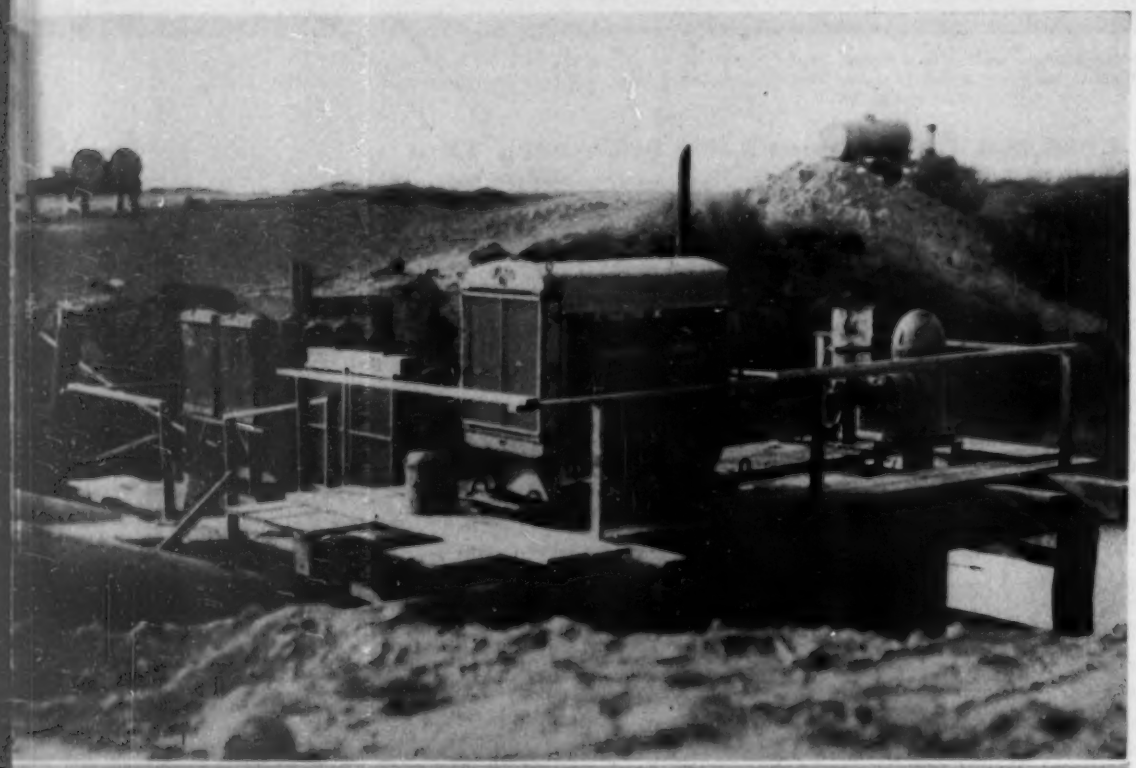
A visit around the diesel farm equipment dealers at Bakersfield, Shafter, Wasco, Fresno, Five Points, Dos Palos, Madera, Merced, Los Banos, Tulare, and Firebaugh really gave the visitors an appreciation of the place dieselized equipment is playing in the production of cotton. Before October 1, John Pickett, editor of "California Farmer," estimated the 1952 California cotton crop worth $395,887,000. By December 1, it was over $400,000,000, to make it the No. 1 cash crop of California.

Breaking down the California dieselized cotton story, the state has come up from 489,000 acres in 1941, only 11 years back, as we went into World War II, and the indicated yield of 652 pounds per acre is 46 pounds above the 10-year average from 1941 to 1950. Total bales will be 1,273,000 above that 10-year average. Also both Arizona and Nevada, though on much smaller scales, are setting records for increases in cotton production. Arizona's long staple cotton, in 1952, lifted the yield to 764 pounds per acre, top of the nation.

On equipment, hundreds of millions are invested in cotton mills, gins, and compresses. There were



Top: **One of six similar pumping irrigation installations on the Crocket-Gambogy ranch near Corcoran. Waukesha in foreground with pair of GM Detroit Diesels in back.** ***Bottom:*** **Allis-Chalmers scraper (GM Detroit Diesel) at work adding a newly purchased farm to the farming system of Schramm Ranch. Mobile repair shop in background is also dieselized.**

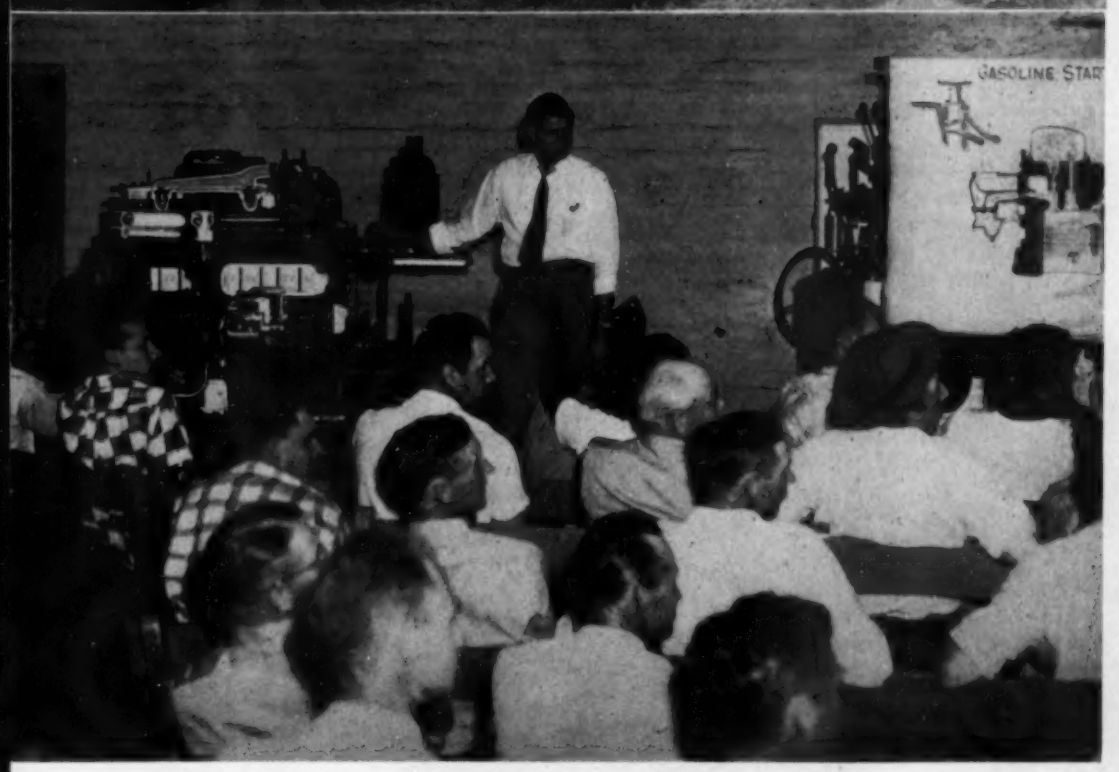


230 gins operating in California this fall. Their yards are already full of acres of racked-up bales waiting to be transferred to the mills for manufacturing into cotton products. The compresses in the state are worth about $10,000,000 according to one estimate. The gins now working are worth another $50,000,000, says the same authority. The investment in warehouses and farm equipment is still another figure worthy of study and breakdown. Before sending the visiting cotton men on tour of the big ranches in the Corcoran area, the Conference was briefed on what to expect on two ranches that the writer went out to renew acquaintances on. Crocket & Fambogy, with headquarters out southwest of Corcoran, seeded 75,000 acres of barley this past fall. They operated 17 Harris combined harvesters in their 1952 crop.

Road work in the West Side San Joaquin cotton belt. This Massey-Harris diesel tractor pulling a Seaman mixer is putting in a new road surface before wet weather and heavy cotton harvest traffic arrives.

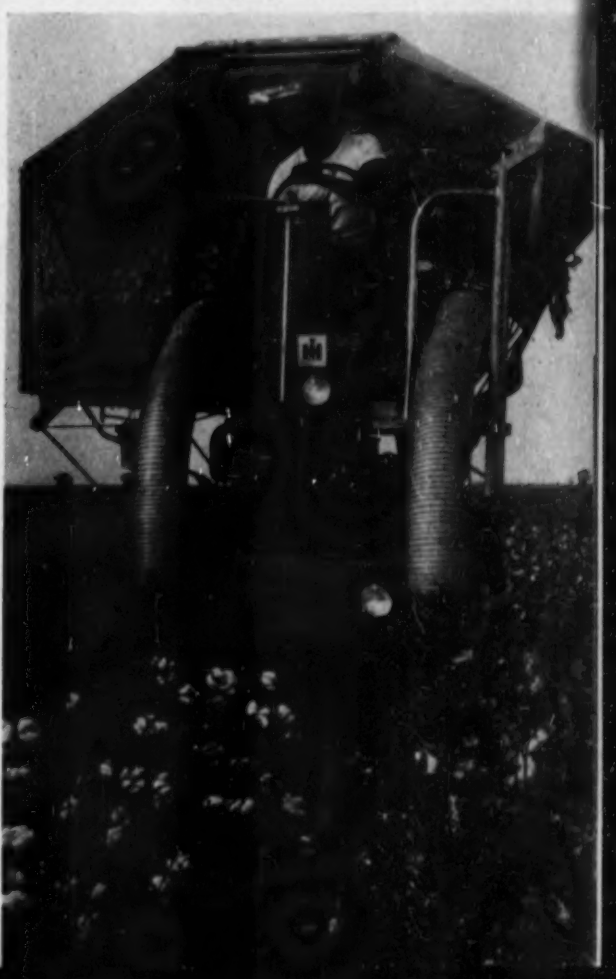
siphon pipe. Case, Deere, International, Ford, Ferguson, Allis-Chalmers, Massey-Harris, Minneapolis-Moline and Caterpillar tractors were hitched to the various equipment demonstrated or left setting. Dealer Al Nikkel showed two items he built at his Shafter shop for the Station.

In the cotton field adjacent to this grandstand show of the above equipment, the mechanical cotton pickers from four different manufacturers appeared in action—International Harvester Company, Allis-Chalmers, Deere Co., and Rust with a Ford engine. As the first three build or sell diesel engines, one may assume that all will be putting dieselized pickers into use before another two seasons pass. The demand is there and half the International pickers are now coming into California with MD tractors, even though the A-C packer is still powered with a gas engine. However, with the close tie-up with GM on diesel engines for the crawler tractors built by Allis-Chalmers, plus GM's efforts to get into the change-over field on old wheel tractors in the mid-west, it seems natural that this versatile power will be used in the picker soon. With the whole cotton area powered with diesel tractors for land leveling, plowing, disking and considerable seeding, the trend to all-diesel cotton farming is as certain as the need for more economical production of this staple crop.



International's staff of service school teachers on the job teaching the IH diesel to farmers, operators, and dealer's service men in California.

One of the fleet of 30-odd International cotton pickers which were mobilized for one day for the benefit of the VFW at San Joaquin.



This ranch operation included the old Elmer Von Glahn ranch which the writer reported on in DIESEL PROGRESS some few years back. It was interesting to visit it again, and tour its diesel operations with the ranch superintendent.

When Von Glahn farmed the ranch, the acreage was already in the 40-section class, but now it covers about 175 sections circling and including much of the old Tulare Lake bed. The crawler tractors are all diesels—Allis-Chalmers and Caterpillars. In spite of being located on a lake bottom, irrigation water has to be pumped and six pairs of GM twins are needed to handle this all important job. We drove out to see and photograph one such installation, passing a fleet of Cat diesels harrowing and seeding with Oliver and Minneapolis-Moline drills hooked up for a 40-foot sweep across the big fields.

There were two big and important demonstrations of cotton farm machines. First, in the field owned and farmed by the U.S.D.A.-UC Cotton Station, three miles northeast of Wasco, were lined up the tractors and implements used at the station in its cotton farming. To complete the station exhibit and demonstration, dealers from Wasco, Shafter and other nearby points brought in their machines. These included: subsoiler, 2-way plow, toolbar lister, till-n-pack cultipacker, old 2-row planter originally used by the Station, new 2-row experimental planter, rotary crust breaker, ditch-blocker, border disk, sweep and flame cultivators, self-propelled topper, irrigation methods including

MODEL "U" DIESEL TRACTOR

THE Minneapolis-Moline Company has now completed its first production lot of the new dieselized Model U tractor. This model is in the 3- to 4-plow power class having 37 hp. on the drawbar and 40 hp. on the belt. These figures are estimated because time limitations have not permitted official Nebraska tests. The engine is an MM product with a combustion chamber specially designed and licensed by the Lanova Corporation, and is equipped with a Bosch fuel injection system. A Lanova type engine was chosen by MM engineers because of the controlled rotary-turbulence combustion and complete fuel burning features that result in high fuel efficiency and long life.

It is expected that during 1953 full scale production of the model U will greatly increase not only agricultural but industrial drawbar applications for the Model U, previously available only as gasoline, distillate, or LP gas equipment. Plans also include production of the UTIL industrial loader tractor dieselized as soon as all material is available in quantity. Brief engine specifications: engine make—own; bore and stroke 4¼" x 5"; number of cylinders—4; piston displacement 283.7 cu. in.; normal governed speed (full load) 1300 rpm.; compression ration 14.9:1; hp. (normal governed speed) drawbar 37, belt 40; battery, 12 volt.

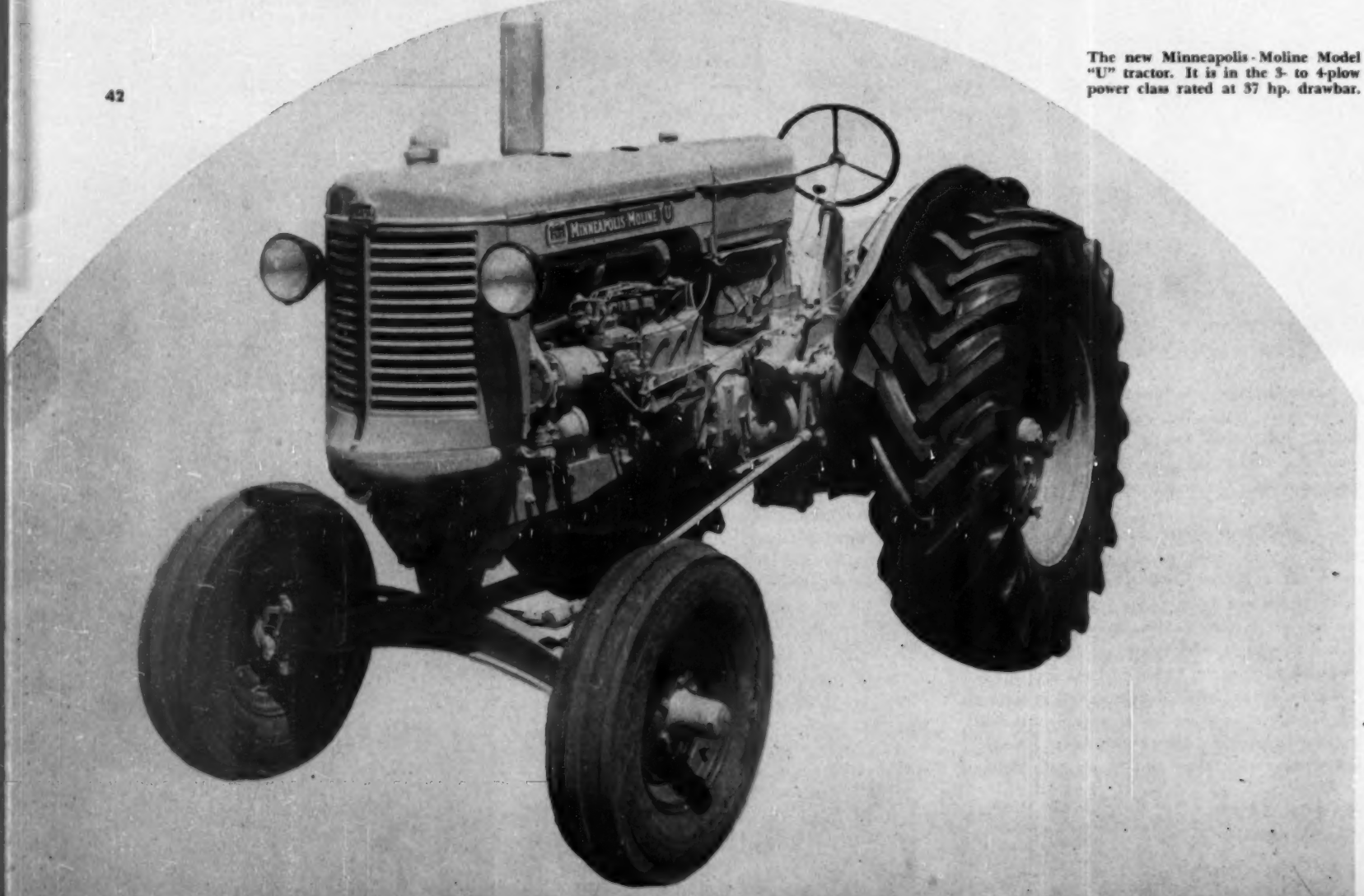
Diesel engines are increasing in use for many industrial applications of power. Their use has become very popular on locomotives, trucks, buses and heavy construction equipment. Engineering developments of diesel equipment and the inherent fuel savings of dieselization have resulted in its adoption for farm tractors. Some of the important factors affecting this change are price, quality, and availability of fuel. To meet these conditions, a diesel has been developed for the Model U.

The Model U diesel tractor has incorporated the Lanova combustion system which was developed for Minneapolis-Moline by the Lanova Corporation. The main feature of this system is the use of an energy cell where rich mixtures of fuel are injected that burn rapidly. The rapid production of combustion gases build up higher pressures and temperatures in the cell than in the other parts of the combustion chamber so that they are expelled in a high velocity jet stream. This resulting jet of gases produces very high turbulence to improve and control complete progressive burning of the fuel. The Lanova combustion system does produce high fuel efficiency, particularly for small bore.

The injection system adopted for this engine is the Bosch single plunger pump. This is a recent development by the Bosch Corporation which incorporates many desirable features of the injection pumps manufactured by this company for many years, plus the economy of a single plunger pump. The nozzles are manufactured by Bosch and are designed for ease and economical servicing and replacement. The transfer pump is a gear type, insuring positive delivery of fuel to the pump.

Clean fuel is important in diesel engine operation to obtain long life, which requires an extremely good fuel filtering system. On the Model U, a three stage filtering system consisting of one primary stage and two secondary stages has been adapted. The primary filter is a very fine screen, fine enough to separate some water from the fuel. A handy drain cock is provided to drain accumulated water from the system at the base of the primary filter. Good practice demands, however, that the operator keep water out of the fuel storage container. The secondary filters are made of micronic paper which has excellent properties to separate dirt from fuel. The first secondary filter is placed before the transfer pump, and the final filter is in the discharge line of the transfer pump to the distributor head of the injection pump. A very large capacity oil filter has been designed to fit into the base pan of the engine. Improved filtering properties will be obtained inasmuch as the oil temperature will be maintained closer to the desirable filtering temperature range. In addition to this, the fuel filter is located in a place where it is not subject to interference with mounted implements.

The diesel cycle presents greater design problems for oil consumption control and piston design than for gasoline. A heavy duty, cam ground, tin plated aluminum piston with five piston ring grooves has been incorporated into the design of the Model U diesel engine. Three high grade compression rings and two oil control rings are used. The full floating piston pin with liberal bearing areas of the 283



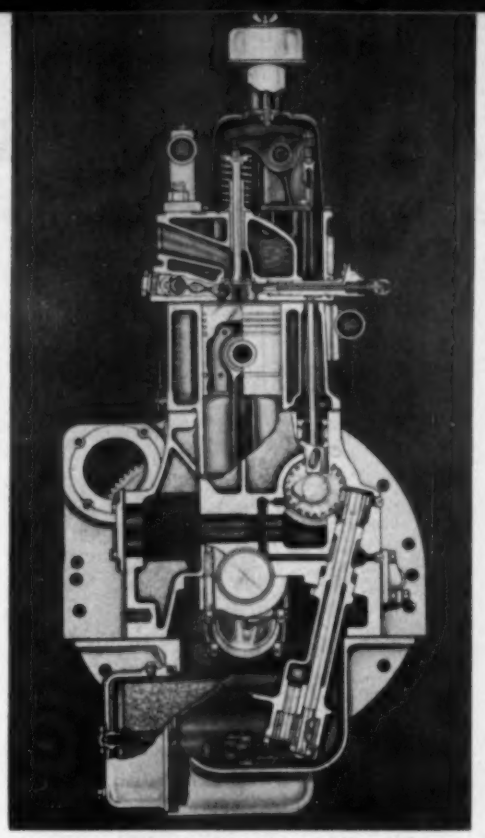
The new Minneapolis-Moline Model "U" tractor. It is in the 3- to 4-plow power class rated at 37 hp. drawbar.

gasoline engine design has been retained. The adopted design is the result of many years of field and laboratory testing. The same design problems are presented on crankshaft bearings. Therefore high capacity bearings of the tri-metal construction have been adopted. Tri-metal bearings are a steel shell with a section of copper alloy, and a section of babbitt; hence the name tri-metal. The Model U engine has liberal crankshaft journal dimensions and due to the selective material used in its construction, hardened crankshaft journals have not been necessary to develop a satisfactory design for the diesel cycle.

To accommodate the additional stresses on the critical studs by the adoption of the diesel cycle, the main bearing studs were increased in size and quality, and the cylinder head studs were increased in number. The crankcase structure was improved in strength by additional rib sections which also have been adopted for the gasoline models. The cylinder head supports and encloses the parts comprising the principle of the Lanova combustion system and is therefore a complete new design. The cylinder block is also a new part to accommodate the additional cylinder head studs. A single package water pump of improved design has been added to Model U diesel engine. The design features a stainless steel shaft, an improved automatic seal, and a new impeller. It is a unit construction which makes for ease of replacement and service.

The starting equipment adopted for this engine is a 12 volt system. Two heavy duty, high discharge 6 volt batteries are used. The general classification of these batteries is under a Group 4 truck and bus battery. The adoption of the Group 4 battery, which is carried in most service stations, makes it possible to obtain replacements and still retain the high battery requirements for diesel engines. 1953 production will have 2, 12-volt batteries in parallel. Several cold starting devices are presently under test, and one will be adopted to improve the cold weather starting of the engine.

In general, the chassis of the tractor has not been changed. The only changes incorporated were those made to accommodate the mounting of the battery, the changes in the electrical system, air cleaner and thermostat housings. The engine is completely interchangeable with the gasoline engines used on present Model U tractors. Tractor



Cross-section drawing of the Model "U" diesel engine from Lanova designs.

accessories will be available for the diesel tractor as for all other fuels, such as Uni-Matic Power, live power take-off, "de-engageable belt pulley," and the regular power take-off.

The maximum power output of the tractor is approximately 40 (belt hp. corrected). The inherent advantage of dieselization is fuel economy. Diesel engines not only produce more power per pound of fuel, as compared to gasoline, but also produce more power per gallon. This added advantage comes in the weight differences per gallon. Diesel fuel is the heaviest of the fuels used in farm tractors, and inasmuch as fuel is sold by the gallon, the resulting fuel consumption in gallons per hour is the smallest. Field records of experimental models of the Model U diesel tractor indicate considerable savings over gasoline consumption can be expected when it is compared on the per acre or per unit of work basis over an annual period.

Diesel engines use the same quantity of air regardless of the load, whereas gasoline engines are metered as to air usage by the size load imposed. The air cleaner has greater duty to perform on a diesel engine and will accumulate more dirt. Therefore the operator must be encouraged to clean it more often than is otherwise required with gasoline tractors. However, it should not be interpreted that the diesel air cleaner is too small, but that it only works harder. Tractors are equipped with good fuel filtering devices. However, the operator must not use them as an excuse for poor fuel handling habits. Encourage operators to keep fuel clean and free from water. Longer trouble free operation, and lower maintenance costs will result.

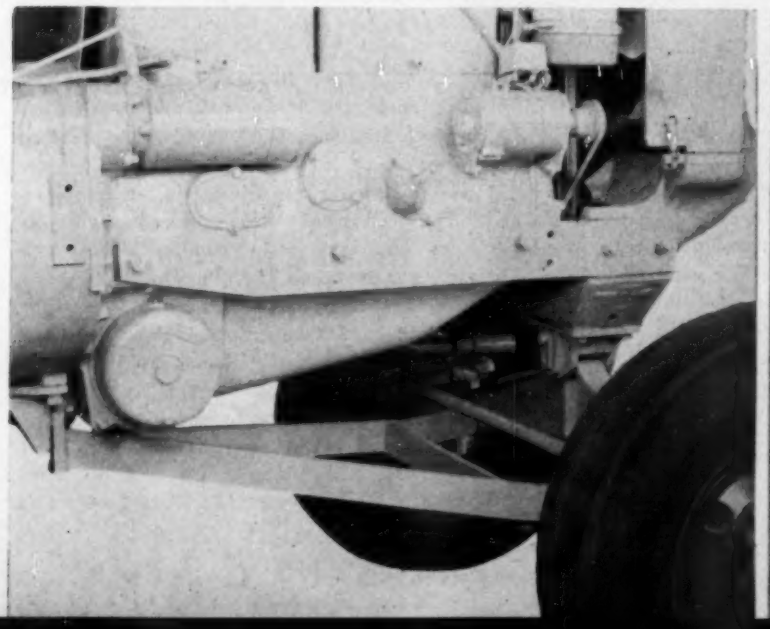
The expected advantages in fuel savings that can be obtained with dieselization must be weighed against the increased first cost of the tractor. Fuel savings will increase with hours of service. Several studies have been made in comparing diesel to other power, and it has been established that some 800 to 1000 hours in annual operation are required to return the first cost of diesel tractors in this power class before the break-even point is reached. In comparing costs with other fuels are four factors that must be considered, and these are as follows: (a) investment cost, (b) fuel cost, (c) maintenance cost, and (d) oil cost.

The greatest factor in tractor operating costs is fuel. Although diesel tractors will show the greatest savings in this category, they must be offset by higher investment, maintenance and lubricating oil costs. It is therefore axiomatic, the greater number of hours the tractor is operated, the greater fuel savings will result and the smaller offset for higher maintenance and investment charges. Weighing all of these factors, the economy of one fuel over another will be determined by the prices of the fuel in each locality.

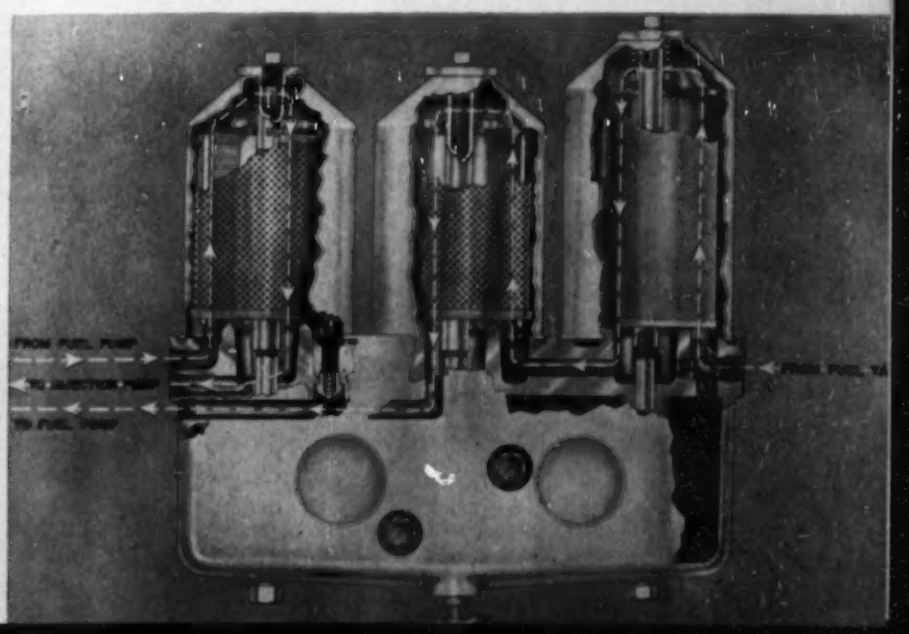
List of Equipment

Fuel oil filter elements—Fram.
Lube oil filter elements—DeLuxe or Purolator.
Crankshaft and connecting rod bearings—Cleveland Graphite Bronze.
Fuel pump and governor—Bosch.
Cranking motor—Delco-Remy.
Valves—Eaton.
Pistons—Aluminum Industries.
Piston rings—Wassau or McQuay—Norris.
Air filter—Donaldson.

Close-up of the engine showing the Delco-Remy electric starter.



Diagrammatic drawing of the Model "U" three stage fuel filter with Fram elements.



KANAI, ALASKA

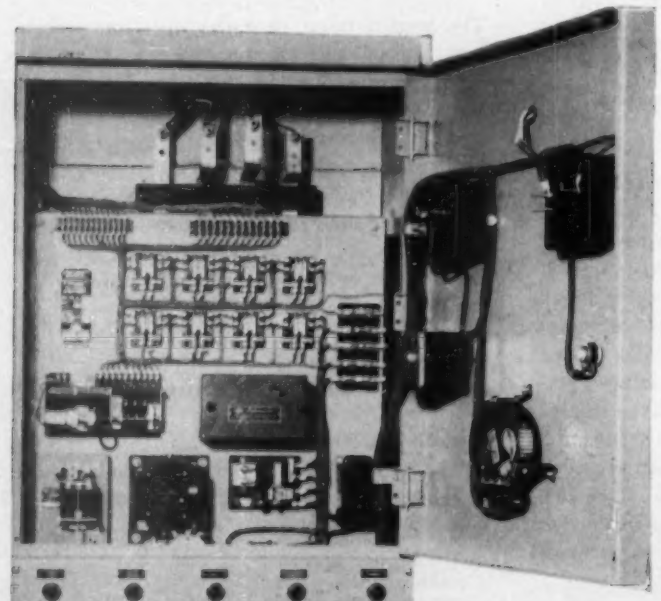
Three-Unit Automatic Emergency Plant Has Unique Control Features

By BRUCE WADMAN

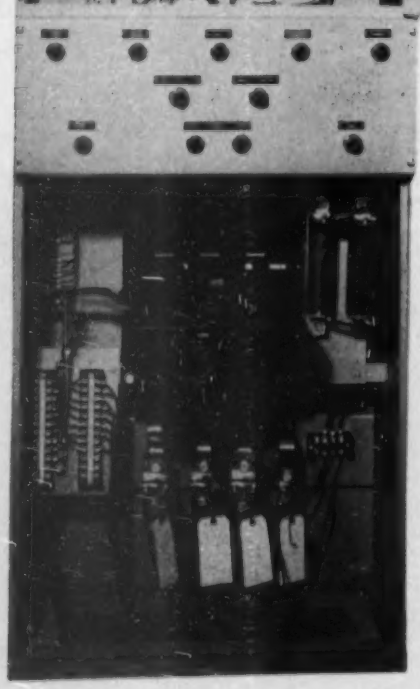
KING-KNIGHT Company, Engineers, of San Francisco, have recently completed the design, manufacture and test of a fully automatic, Buda diesel engined, three-unit emergency power plant that embodies many new ideas in control, for installation at Kanai, Alaska.

The plant consists of three diesel generating units, each rated at 100 kw.; three combination control panels, each with complete generator control switchgear, automatic engine starting equipment and automatic synchronizing equipment; and a single master selector panel. Illustration shows the entire plant as it appeared when set up for final testing at King-Knight Company's San Francisco shops. Other illustrations show close-up views of the individual units and of the electrical equipment.

The design and construction of deisel engined emergency generating plants, together with their automatic starting and control equipment, has for many years been a specialty with King-Knight Company. Recognizing that overall reliability,



Interior of the automatic control panel for the three Buda diesels going up to Kanai, Alaska.



minimum lost time in reaching operating speed, and simplicity of equipment are the three basic requirements of any emergency power plant, the designers have here produced a plant which scores high in all three of these qualities. In the following paragraphs the component parts of the plant and of the control equipment will be described in detail

The application for which this plant was designed is one where the electric load to be carried by the emergency plant is expected to be between 100 kw. and 200 kw. The normal source of electric power will itself be an isolated power plant rather than a connection to a large utility system and it therefore was determined the emergency units should be designed to be capable of operation as an adjunct to the normal source, in order to be useful during peak load periods and periods when one or more of the generating units at the normal source plant might be temporarily out of service. For these reasons it was decided that the emergency plant should consist of three 100 kw. units rather than a single 200 kw. unit, and that these three units should be built to such a design as to be capable of continuous operation.

Buda, model 6DC-1742, diesel engines were selected to power the three Columbia generators. These are six cylinder, naturally aspirated engines, having 6½-in. bore and 8¾-in. stroke, and are rated at 150 hp. at an operating speed of 900 rpm. Electric starting is employed, each engine taking its starting current from its own 15-cell Exide storage battery. The engines are equipped with standard Bosch en bloc fuel pumps which are under the control of Woodward, model SG, hydraulic governors. Safety devices include an instantaneous shutdown in the event of over-speeding and a delayed shutdown in the event of low oil pressure or high water temperature. This delay is introduced to permit the idle unit to start and to come into service before the unit in distress is dropped off the line and shut down. An audible alarm and a system of indicating lamps on the control panel identify the source of the trouble.

The 900 rpm. Columbia generators are fitted with individual, top mounted, belt driven exciters. These generators are standard ball bearing machines with amortisseur windings and are rated at 125 kva., 120/208 volts, 3 phase, 4 wire, 60 cycles. The generator shafts are coupled to the engine flywheels through special rubber-inserted-link type flexible couplings manufactured by the F.A.B. Manufacturing Company. Each engine-generator unit is a complete plant consisting of the engine and generator, mounted and coupled together on a rigid structural steel unit base designed to be carried on ten Korfund vibration isolators. As may be seen in the illustration, each unit carries its own radiator and fan cooling system.

The control system has been designed to operate in conjunction with an Automatic Switch Company's electrically operated, mechanically held load transfer switch. A single master selector panel contains a five-position rotary switch, through operation of which any two of the engine-generator units, or all three units, may be set up in automatic emergency condition. The fifth position on the selector switch locks out all three units. A group of six lamps on the master panel, three green and three red, shows at a glance which units have been set up in emergency condition and whether any unit has been locked out by operation of its lockout switch on its own control panel. It was men-

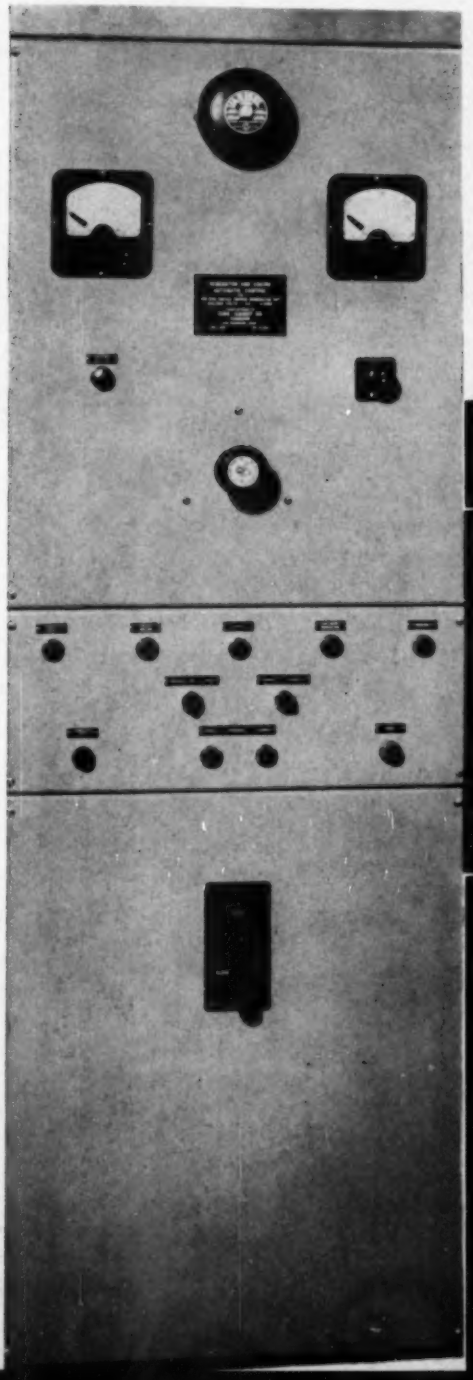
tioned earlier that the load to be accepted by the emergency plant was beyond the capacity of a single unit. For this reason, operation of the automatic load transfer switch from its "normal" to its "emergency" position is withheld until two engine-generator units are in operation and are paralleled together on the emergency bus. If the selector switch is set in the position for all three units to be in automatic emergency, then operation of the load transfer switch is contingent upon all three units being in operation and paralleled. Other features of the control system are that if either of the two selected units fails to start after a reasonable time, the third unit is started and brought onto the bus in place of the unit which failed to start. Further, with two units running and loaded, if either suffers from a low oil pressure or high water temperature condition, the third unit is started and brought onto the bus to take the place of the unit in distress, whereupon the troubled unit is removed from the bus and is shut down. All of these operations are completely automatic.

In other multi-unit, automatic paralleling installations which have been described in this magazine, the control circuits have been such that one unit has been pre-selected as the "lead" unit and this unit must be the first to connect to the bus, the subsequent unit or units paralleling in turn. In this plant, however, no unit is pre-selected as the leader. The first unit to reach rated speed and voltage immediately closes its circuit breaker to energize the bus; this momentarily locks out the other units and they close to the bus under the control of their individual paralleling control relays. This method of control places the emergency equipment into service with the least possible loss of time. Each of the three individual control panels contains a bare minimum of instruments and equipment—for instruments, merely a voltmeter and ammeter for each generator. The reasoning here is that this is intended to be a fully automatic plant and that therefore it will not be attended by an operator to whom the indications of a multiplicity of instruments would tell an intelligible story. Each panel includes an electrically operated circuit breaker, a paralleling relay to close the breaker at the right instant, an automatic voltage regulator, and the engine starting and monitoring equipment. Division of load between the units is, of course, a function of their individual governors; but, in the case of an emergency plant, equal load division, while perhaps desirable, is certainly not mandatory. As nearly as it is possible to do so, the engine governors have been set for identical no-load speed and for identical speed droop, about 2%. In addition, the fuel control rack on each engine has been fitted with a mechanical stop adjusted to limit the load to a maximum value of 110% of rated load. This is expected to result in an operation which, while it may not accurately divide the load equally between the units, will prevent any unit from attempting to carry more load than it can safely accept. The generated output will not vary from normal 60 cycle frequency by more than about 2%, which is close enough control for most, if not all, emergency applications.

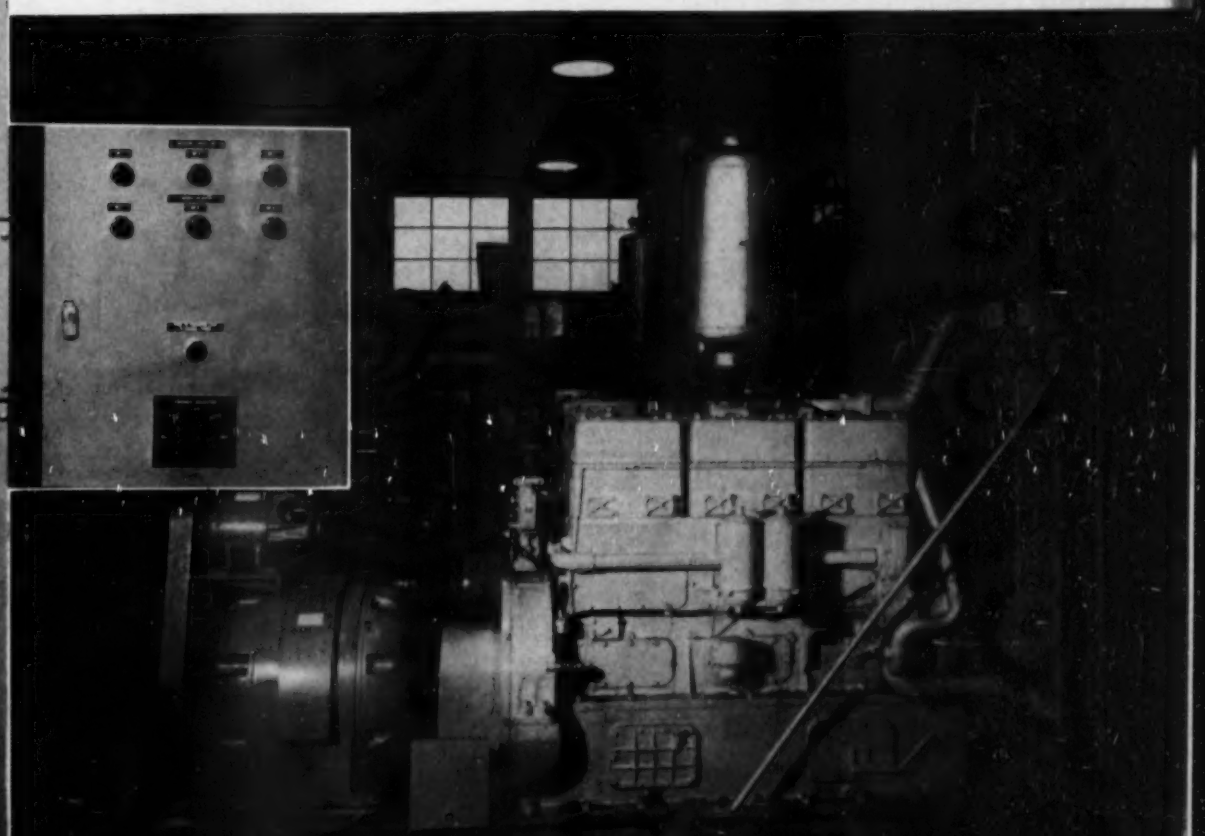
General Electric Company automatic voltage regulators are used in each control panel to hold the generated voltage at pre-set value and to distribute the reactive current equally between the generators. The magnetically operated circuit breakers are of Westinghouse manufacture and employ 208 volt a.c. closing coils. The breaker tripping coils are energized from the 30 volt battery circuits, this feature being installed so that tripping power will be available under any conceivable emergency condition. Voltage-frequency sensitive relays made by Automatic Switch Company are used with each unit to indicate its readiness for connection to the bus, and synchronizing relays manufactured by Electric Machinery Manufacturing Company act to complete the breaker closing circuits at the instant of synchronization.

In the construction of this three-unit plant, the designers and builders, King-Knight Company, have assembled equipment built by leading electrical and engine manufacturers of the nation into a coordinated plant that truly exemplifies the three principal requisites of an emergency power plant: reliability, speed in getting into operation, and simplicity of construction.

A CIVIL DEFENSE INSTALLATION



Close-up of automatic control panel with Master Selector Panel.



The three Buda 100 kw. generator sets with Columbia generators and exciters in the King-Knight shop before shipment.

ALLIED-ASHLAND

HARNESSING a mighty team of work-horses, 4800 of them, the new *Allied-Ashland* left the docks of the Calumet Shipyard & Drydock Company in South Chicago recently. She made her way down the Chicago River, into the Illinois and then the Mississippi. In the meantime, her eight barge integrated tow was being completed by the Ingalls Shipbuilding Corp. at Decatur, Alabama. This tow will enable the ship to move a full cargo of 200,000 barrels of crude oil at a still water speed of nine miles per hour.

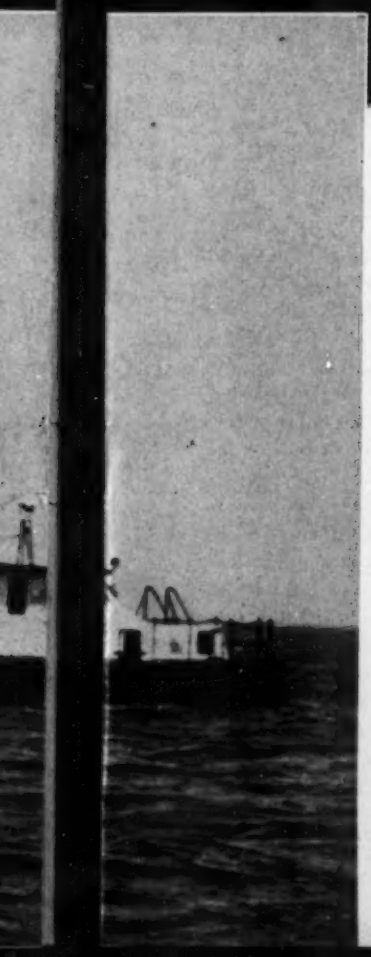
The *Allied-Ashland* is a sister ship to the *Aetna-Louisville* which was launched a year earlier. (See DIESEL PROGRESS, December 1951.) Both are owned and operated by the Ashland Oil & Refining Company of Ashland, Kentucky. These two sister ships are among the most powerful craft operating on the Ohio-Mississippi River system. From her keel up to the bridge, the *Allied-Ashland* represents the ultimate in river towing efficiency and at the same time manages to provide the greatest comfort for the crew. Individual staterooms are provided for the captain, the chief engineer, the assistant engineer and the pilot. A comfortable lounge is provided for the use of the 16-man crew. All quarters are equipped with fluorescent lighting and are air conditioned.

The main propulsion units consist of three 16-cylinder General Motors' Cleveland Division diesel engines equipped with Marquette Governors. They are Model 16-278A developing 1600 hp. each at 750 rpm. and drive three propellers through reduction gears at about 225 rpm. The propellers are eight feet in diameter and have a pitch of 7½ feet. Auxiliary power is provided by three GM Cleveland Diesel Model 3-268A diesel generator sets providing 100 kw., 440 volt, three phase, 60 cycle alternating current and 20 kw. 120 volt, direct current on the same armature shaft. These diesel engines generate all the electricity for the air compressors, capstans, fire pumps, bilge and ballast pumps, automatic pilot, the water filtration and purification system, pilot house control of the main engines, radar, all the communications which include ship-to-shore telephone and even television.

The *Allied-Ashland* has a length of 150 feet, a beam of 50 feet and a depth of hold of 10½ feet. The engine room is a roomy 42 feet long by 50 feet wide. The main engines are arranged in parallel with two of the auxiliary generating sets between the port and center engines and the third located between the center and starboard engines. Fuel oil tanks are on either side forming the wing tanks. Nine rudders make for maximum maneuverability permitting the ship with tow to negotiate river bends without excessive reduction of speed. Three steering rudders are directly astern of the Kort nozzles. The other rudders are for flanking and going astern.

The barges of her eight-barge integrated tow are made-up two abreast and four long, giving the tow a width of 105 feet and a length of 1,170 feet, more than one-fifth of a mile. Her speed of nine miles per hour in still water with a tow of 200,000 barrels

The *Allied-Ashland* behind her integrated tow of eight barges. Her 4800 hp. generated by three GM Cleveland Diesels are capable of moving her along with 200,000 barrels of crude at 9 mph.



Portside view of the *Allied-Ashland* showing her trim, powerful lines. She is the latest addition to the Ashland Oil & Refining Company river fleet.

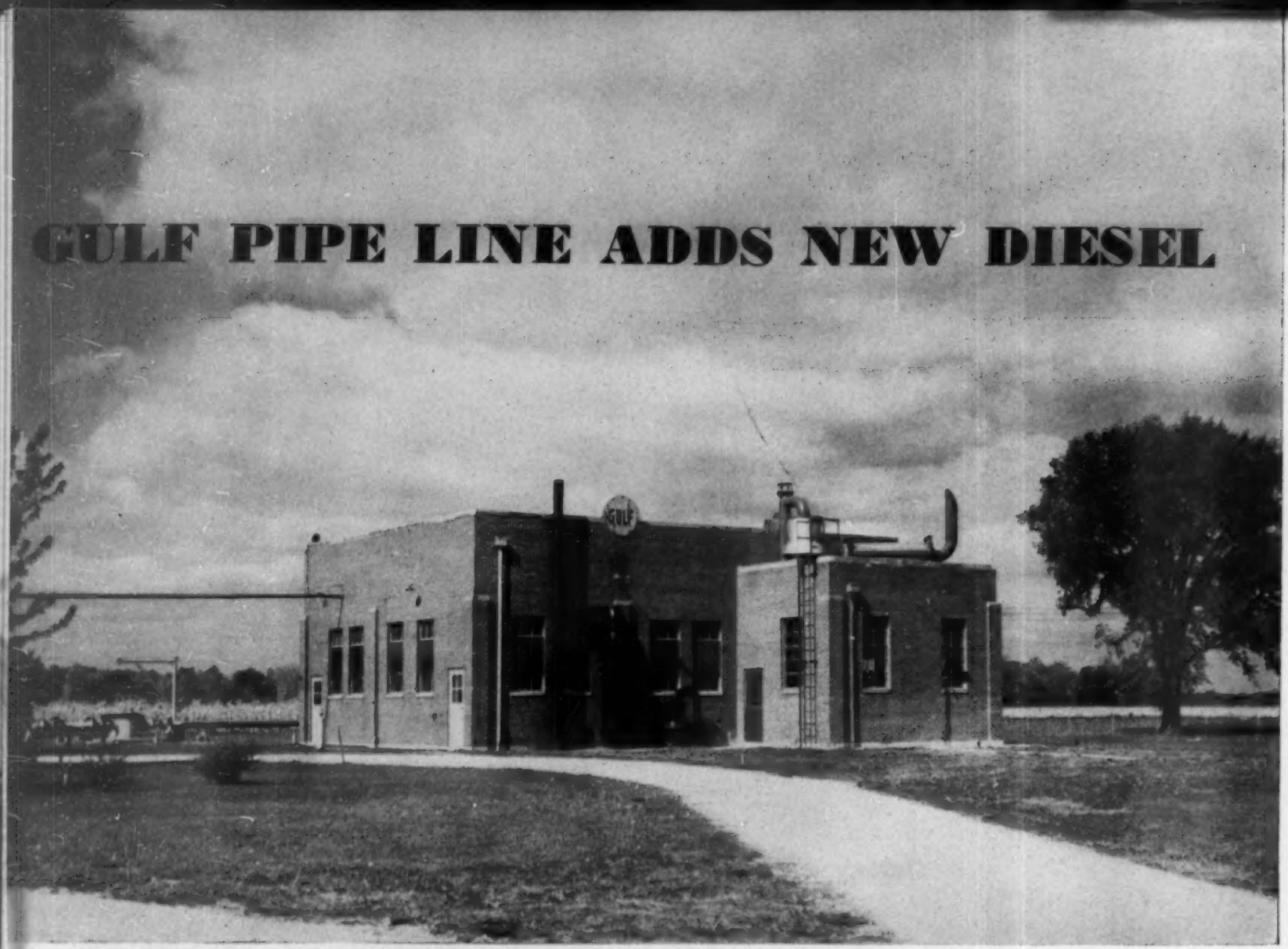
of crude is a full load speed. It can be increased by as much as six miles per hour with lighter loads. The *Allied-Ashland* replaces a number of smaller boats and barges which the company had been chartering from other operators.

On her trip out of the shipyard, the craft had Captain Tommy Stevenson at the helm. Captain Stevenson is a veteran of eleven years of service with Ashland. In taking the ship over the fourteen miles of Lake Michigan to the Chicago River, the crew and observers got a good idea of how a well constructed river boat behaves when navigating over choppy open water. In this short trip, the *Allied-Ashland* pushed through waves which broke clear over her high towing knees, sending a heavy spray over the entire forward section as high as the pilot house. The spray was so heavy that the pilot house windows had to be closed. Through it all, she maintained an even keel with only a slight roll. The only effect was a thorough wetting. It is highly unlikely that she will ever again be called upon to suffer such severe buffeting on the calmer river waters.

List of Equipment

Main Engines—Three GM Cleveland Diesel engines Model 16-279A, 1600 hp. each at 750 rpm.
Auxiliary Engines—Three GM Cleveland Diesel engines, Model 3-268A.
Governors—Marquette.
Reduction Gears—Falk.
Lube Oil Filters—Briggs.
Lube Oil Strainers—Purolator.
Fuel Oil Filters, Main Engines—Purolator.
Fuel Oil Filters, Aux. Engines—Commercial.
Jacket Water Coolers—Ross.
Lube Oil Heat Exchangers—Ross.
Tachometers—Weston.
Engine Alarm Controls—Synchro-Start.
Main Engine Alarms—Viking.
Pyrometers—Bristol.
Reduction Gear Lube Oil Heat Exchanger—Ross.
Water Temperature Alarm Switch—Detroit.
Temperature Regulators—Fulton Sylphon.
Ac. and dc. Generators—Westinghouse.
Depth Recorder—Bendix Aviation Corp.
Radio Telephone—RCA.

GULF PIPE LINE ADDS NEW DIESEL



Gulf State Line Station on the Ohio-Indiana border has a new Alco diesel capable of handling 60,000 bbl. of crude per day at a pressure differential of 900 psi. Note American air filter and Maxim silencer for new engine on top of building.

New Alco Diesel Boosts Gulf Station's Capacity. Most Powerful Unit on Tulsa - Lima Pipeline Designed to Raise Output 46% and Increase Pressure Differential 400 psi.; Original Alco Units Have Run 165,000 Engine-Hrs.

INSTALLATION of a 1,170 hp. Alco diesel in the Gulf Refining Company's State Line station has raised current throughput to 47,000 bbl. per day and will give the station an estimated pumping capacity of 60,000 bbl. per day at a pressure differential of 900 lb. when additional pipeline facilities are installed to deliver that volume to the station.

The new unit, put into service in June 1951, is the most powerful engine in the 15-station line and its potential pumping volume represents a gain of 46 percent with an additional 400 psi. compared with the previous engine's output. This 700-mile pipe line was built originally in 1930 to transport crude oil from Tulsa to refineries at Cincinnati, Toledo and Pittsburgh. Northern terminus of the 10-in. line is Spencerville Junction (ten miles southwest of Lima, Ohio) where it joins the Buckeye line. Originally, the line had 14 pumping stations, 13 with a total of 28 Alco diesels rated at 316 hp. and one station with three 200 hp. DeLa Vergnes. All engines drive reciprocating pumps.

In 1936, line capacity was increased by installation of one 340 hp. Busch-Sulzer diesel at each station.

The performance record of the original engines is worth noting. During the first 11 years of operation, from 1930 to 1941, the engines were in service an average of 75 percent of the time. In the 11 years since 1941, all the engines have run an average of 97 percent of the time. Thus, the original Alco diesels have run more than 165,00 hours in the 22 years. Today these stations continue their heavy operating schedules without standby equipment. Each engine is in actual service an average of 97 percent of the time, is available for service 98½ percent of the time, is shut down for maintenance only 1½ percent. In 1941, the line met the demand for greater throughput by increasing the speed and output of all existing engines, getting an estimated 360 hp. from the 316 hp. units, and raising line pressure from 700 to 800 psi. Deliveries to Lima were further increased by construction of a new station at State Line on the Indiana-Ohio border, 38 miles south of the Junction point with the Buckeye line. This station went into service in February 1942 with a 425 hp. Cooper-Bessemer diesel driving a 3-stage Goulds centrifugal pump. Volume was 41,000 bbl. per day with a pressure differential of 500 psi.

Finally, in 1950, it became necessary to increase deliveries to Lima by another 6,000 bbl. per day. Rather than adopt some makeshift to provide for immediate needs, Gulf engineers decided on a major expansion of this key station not merely to deliver the 47,000 bbl. per day then required but to allow for anticipated future production of 60,000 bbl. at a suction pressure of 100 psi. and a discharge of 1,000 psi. To accomplish this, the company installed the line's most powerful engine, a diesel rated at 1,170 hp. This latest prime mover, like the original engines of the line, is an Alco diesel of the 4-cycle McIntosh & Seymour design. It is an 8-cylinder unit with 12½-in. bore and 13-in. stroke, developing its rated horsepower

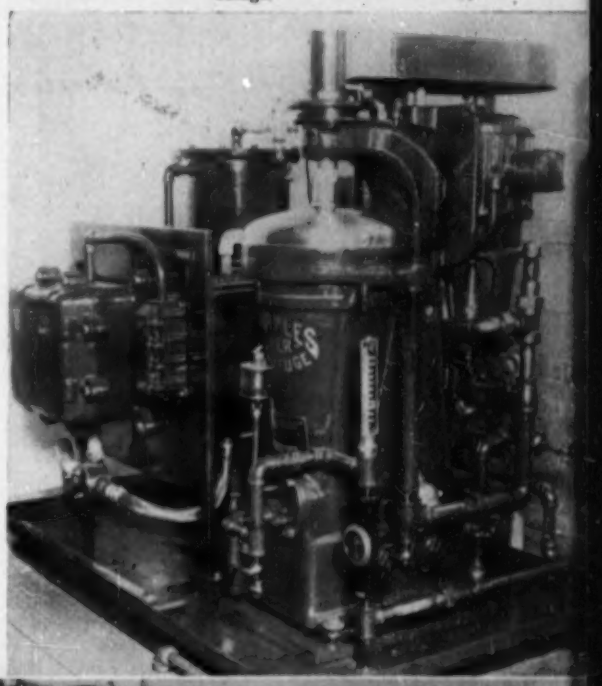
at 650 rpm. Driving through a gear unit of 5.409 to 1 ratio, the diesel turns a 6-stage United Iron Works centrifugal pump at 3550 rpm. The pump is rated at 1750 gpm. at 2660 ft. head. Engine and pump currently are handling an average of 47,000 bbl. per day but have the capacity to pump 60,000 bbl. at a pressure differential of 900 lb. when pipeline capacity is increased to handle that volume. In the installation of the new diesel and accessory equipment.

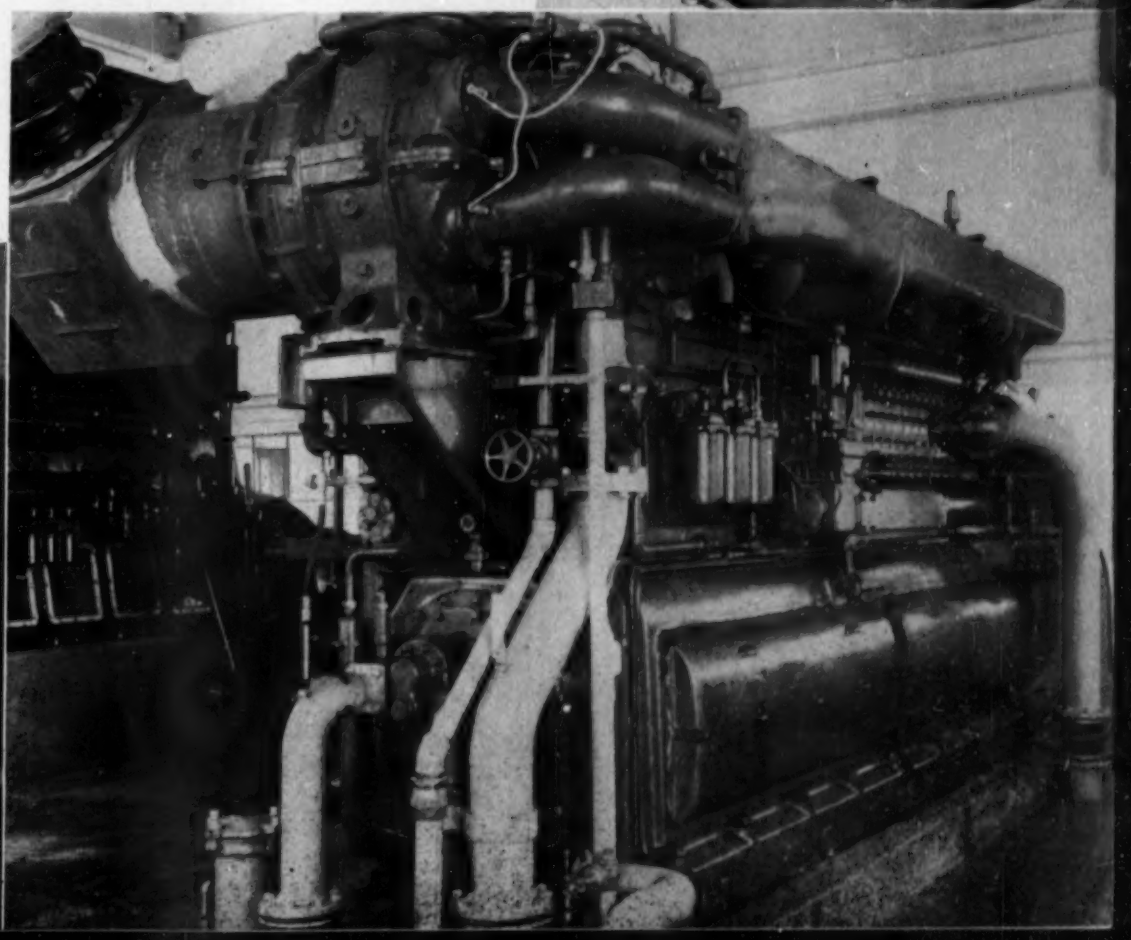
The diesel burns crude oil taken from the pipe line and stored in a 1200 bbl. tank. The operators try to load up the tank with good fuel but take whatever is available when they have to. The crude is transferred from storage to a 250-gal. day tank by an automatic float-controlled gear pump. The oil is heated to 110°F. by heat transfer from engine jacket water and then is put through a centrifuge, after which it is pumped to a 250-gal. clean-oil tank. The clean-oil tank has an overflow line back to the dirty-oil tank so that it is possible to keep the centrifuge running for five or six hours, running the oil through several times. From the clean-oil tank, the fuel flows by gravity through a cellulose filter to the engine's booster pump which delivers the oil through another filter to the individual fuel injection pumps. Surplus from the pumps returns through a spring-loaded relief valve to the clean-oil tank. The Alco is lubricated with Gulf Dieselmotive B, a detergent-type oil which is circulated through the engine under pressure by an engine-driven pump. Included in the circuit is a shell-and-tube oil cooler utilizing engine jacket water to cool the oil. An automatic thermostatic valve bypasses oil around the cooler as necessary to maintain the desired temperature. Some oil is piped from the pressure side of the engine circulating pump to a duplex waste-packed filter. Lube handling is simplified by a highly flexible arrangement of piping. Drums of oil are emptied into a 500 gal. tank and thereafter are handled entirely by a motor-driven transfer pump. Lube can be pumped to or from the engine crankcase, lube cooler, discharge line, bypass line and sump tank. Thus, if the oil became contaminated, it would be possible quickly to empty the entire system and replace the dirty oil with a full charge of clean lube. Engine down time would be held to a minimum. Nugent supplied the following filters for the new Alco diesel: one 1280L size 1R duplex fuel oil filter, one 1280CP size 1R turbo lube oil filter and one 1555 size 4L4 engine lube oil filter which filters all the oil in circulation every cycle before going to the bearings. None is by-passed. Nugent also supplied the No. 1366 sight flow fitting for indicating the flow of oil to the jackets.

Engine cooling water is circulated through the closed cooling system by a centrifugal pump driven off the engine. Water at 147°F. is pumped through the diesel's jackets, leaving the engine at 160°F. Some of this hot water is used to heat the fuel oil, some in a unit heater to heat the plant office. The jacket water is cooled by the incoming crude oil of the main line in a shell-and-tube heat exchanger with 1645 sq. ft. of cooling surface. Cool water from the exchanger is used to cool pump bearings, mechanical seals, gear unit lube and engine lube. Waste heat from the exhaust gases is used to heat the plant and the arrangement is flexible and convenient. The hot gases pass through a jacketed line to the horizontal silencer on the roof. A motor-driven blower draws warm air from the jacket and discharges it into the engine room in cold weather. Louvres in the discharge section of the blower can be reversed in hot weather so that the blower vents to the atmosphere and serves to cool and ventilate the plant.

Intake air for the engine is drawn through an oil-bath filter on the roof to the exhaust-driven turbocharger on the diesel. A gauge and alarm panel holds a multi-point exhaust pyrometer, pressure gauges on lube, water and fuel, and alarms on low lube pressure and high or low jacket water temperature. Starting air for the diesel is provided by a motor-driven compressor. The plant has a 17.5 kw. diesel-generator set to provide electric power to run the motor-driven auxiliary equipment and to supply emergency lighting if outside power sources are cut off. State Line Station operates as a booster station in a closed system, receiving oil from Dublin Station 40 miles to the south and pushing it along to Spencerville Junction and Lima to the north. To insure that the powerful pumping unit does not pump the incoming line dry, automatic valves actuated by pressure of the incoming oil throttle pump output. Gulf's big diesel is operating the heavy schedule required of all prime movers on the line, averaging 97 percent running time and even greater availability.

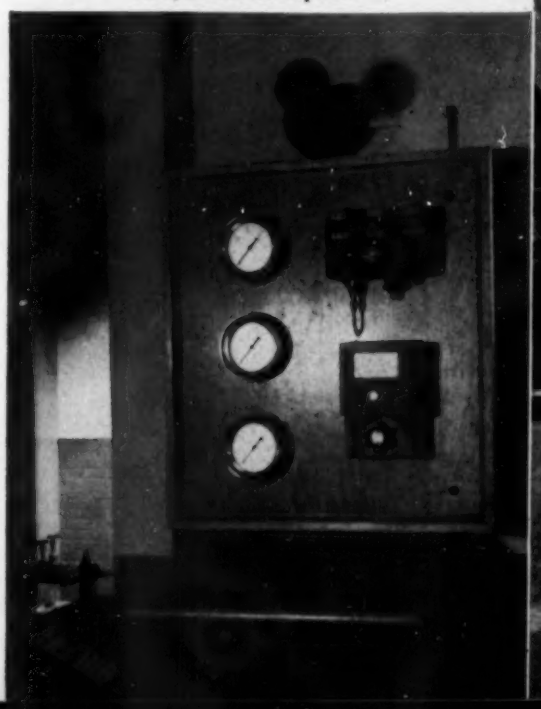
The crude oil used for fuel by the diesel is cleaned in this Sharples centrifuge. 49





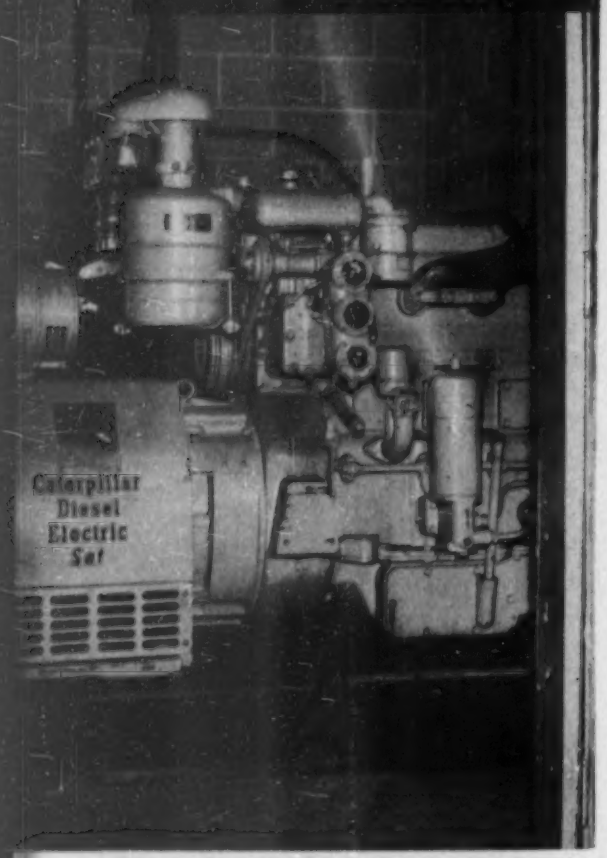
This view of the Alco diesel, which develops 1170 hp. at 650 rpm., shows the exhaust turbocharger, Nugent fuel filters, Woodward governor, and Bosch fuel injection pumps. At left is the 425 hp. Cooper-Bessemer diesel which now serves as a partial standby.

The gauge and alarm panel holds a 17-point Alnor exhaust pyrometer, gauges on lube, water and fuel pressures, and an alarm panel.



CIVIL DEFENSE

EMERGENCY AIRPORT POWER



The Caterpillar diesel-electric set may be seen through the doorway of the generator building. Engine gauges can be read from doorway.

Communications facilities in the Decatur terminal building include a 9.9 watt transmitter, 50-watt instrument beacon and teleptype. These are all an important part of the electrical load.

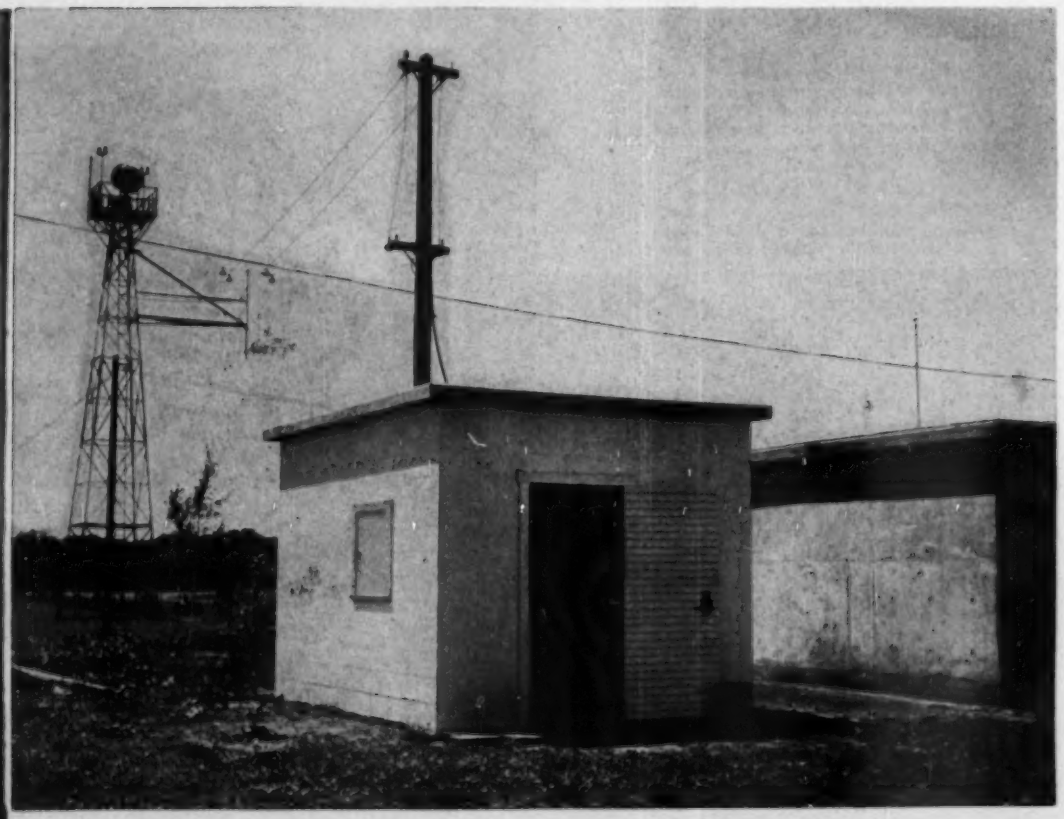
THE stormy night of Friday the 13th was a lucky one for pilots scheduled to land their planes at Decatur Municipal Airport, Decatur, Ill. When outside power failed at 10:30 p.m., a new diesel electric set was ready to go into action. Installation of the set had just been completed the day before. For 11½ hours, until normal power was restored at 10 a.m. Saturday morning, this standby unit kept the airport in operation. The beacon, runway lights, communications and other facilities were protected against power failure. Shortly after the electric set took over the load, a scheduled DC-3 airliner landed safely with its passengers—and six other good-sized aircraft came in that night with the aid of the emergency generator.

"During the type of weather where you'll need communication most, you can least afford to have a situation as occasioned by power failure," commented Joseph K. McLaughlin, director of the Illinois State Department of Aeronautics. McLaughlin, who began his career as a lawyer, has held both civil and military aeronautical posts. He has qualified for a CAA commercial airman's certificate with single and multi-engine ratings. From 1941 to 1945 he served at domestic Naval air stations and aboard Essex-type carriers; then went on inactive duty with the rank of lieutenant-commander.

McLaughlin's Illinois organization has helped to pioneer the idea of a secondary power source at major airports. He believes that such a source ". . . insures the availability of facilities under power failures as might be occasioned by storm, flood, sabotage or military action." Back in 1947, a new type of emergency standby unit was installed in the basement of the terminal building at the municipal airport in Springfield, Ill. This unit was a standard Caterpillar D13000 electric set, but with attachments that made it self-starting within seconds of a power failure. And the unit shut itself off as soon as normal power was restored. Under test, it was observed that the electric set took over the load so fast that the teletype didn't drop a letter. It became the forerunner of standby installations made during the past year in five other major airports in Illinois—at Quincy, Rockford, Decatur, Alton, and Danville.

According to McLaughlin, the intention of his department has been ". . . to provide emergency standby power supply units on every airport in the state where we have paved runways and field lighting." (So far, the main exceptions to this plan have been those major airports with two different, widely separated power line connections.) McLaughlin justifies the need for protection of the power supply to major airports as follows: "(1) Scheduled air carrier operations must continue uninterrupted; (2) Itinerant civilian or military airplanes must have one of the airports as a possible destination in event of an emergency; and (3) Such airport facilities are the natural and vital staging points in a civil defense mobilization."

Building in foreground houses the Cat D315 electric generating set and control board. In rear is the beacon and instrument beacon aerial. At right is the transformer vault.



The cost of each electric set is apportioned by agreement of the CAA, the State Department of Aeronautics and the local community or political subdivision. This latter group actually owning the set is expected to house it, as well as to make run-ups and inspections. Reports on the unit are sent to the state agency so that it will know the airports available in case of emergency. As for the CAA, its relationship to the State Department of Aeronautics under such a procedure has been likened to that of the U. S. Bureau of Public Roads to the Illinois Division of Highways.

With adequate paved runways and field lighting, Decatur Municipal Airport met the requirements of the Illinois program of emergency standby power. The airport is operated by the Decatur Park District, under Supt. Lacy Chandler. It occupies 720 acres of land selected for minimum obstructions. Its 40 acres of concrete include three main runways of 5,300-ft. length and 150-ft. width. Inside a small concrete-block structure near the terminal building is located a Cat D315 electric set of 30 kw. rated capacity. Units of the same size and design have been installed at four other airports in Illinois. However, the standby generator at Decatur does not include the automatic start-stop system. It is manually started by field personnel in the event of outside power failure.

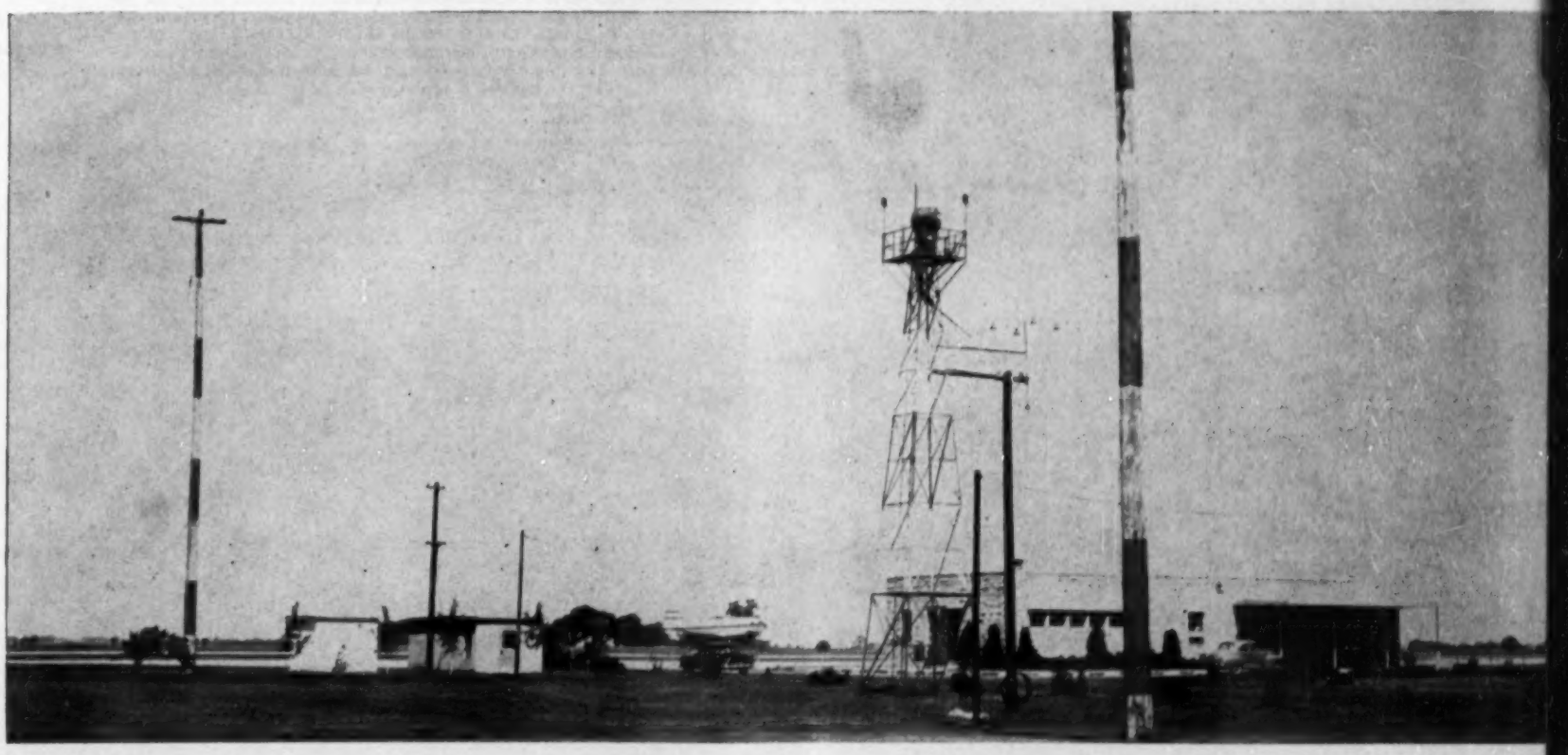
The Cat electric set is self-regulated in that it adjusts itself to the load. The generator operates at 220 volts and delivers single-phase, 60-cycle current. When the set is in operation, the electrical power is conducted through a single-throw fused knife switch mounted on a Johns-Manville asbestos board. A voltmeter is connected across this switch. Next on the line is a set-up transformer behind the board which boosts the voltage to 2,300. Then, for safety, the power is conducted through a Westinghouse double-throw oil submerged switch. This

Don Hart, field engineer at left, supervised the installation at the Decatur Municipal Airport. Lacy Chandler, beside him, is general superintendent of the Decatur Park District which operates the airport.

switch is mechanically interlocked so that outside power and standby power cannot be fed into the airport circuits at the same time. Two potential transformers are mounted on the board with pilot lights to show which is in use.

Every electrical load at the airport normally handled by purchased power can be transferred to the electric set. The total nighttime load averages about 21 kw., leaving 9 kw. of generating capacity as a reserve against any future load increases. Field lighting is by means of a 2,300-volt line to 150 Revere runway lights of 32 watts and 32 runway end markers of 65 watt. Other facilities receive their power at 220 and 110 volts from the main distribution transformers. Among the other elements of the load are the following items: (1) Crouse-Hinds beacon of one million candlepower; (2) Neon-lighted wind tee; (3) Wilcox 411-A instrument beacon of 30-watt capacity, which has a standby; (4) Bendix BC625 radio transmitter of 9.9-watt capacity, which also has a standby; (5) Teletype facilities; (6) Floodlights for the ramp; (7) Terminal building facilities, including interior and accessory lighting, restaurant appliances, electric hot water heater and electrically-operated oil heater. When the standby generator was called upon shortly after its installation to serve these facilities 11½ hours, the incident dramatized the need for an assured power supply.

An Ozark Airlines DC-3 is taking off in the background, moving past generator and terminal buildings. The beacon and other facilities are in the foreground.



TEAMED KNOW-HOW BUILT GREAT DEALERSHIP

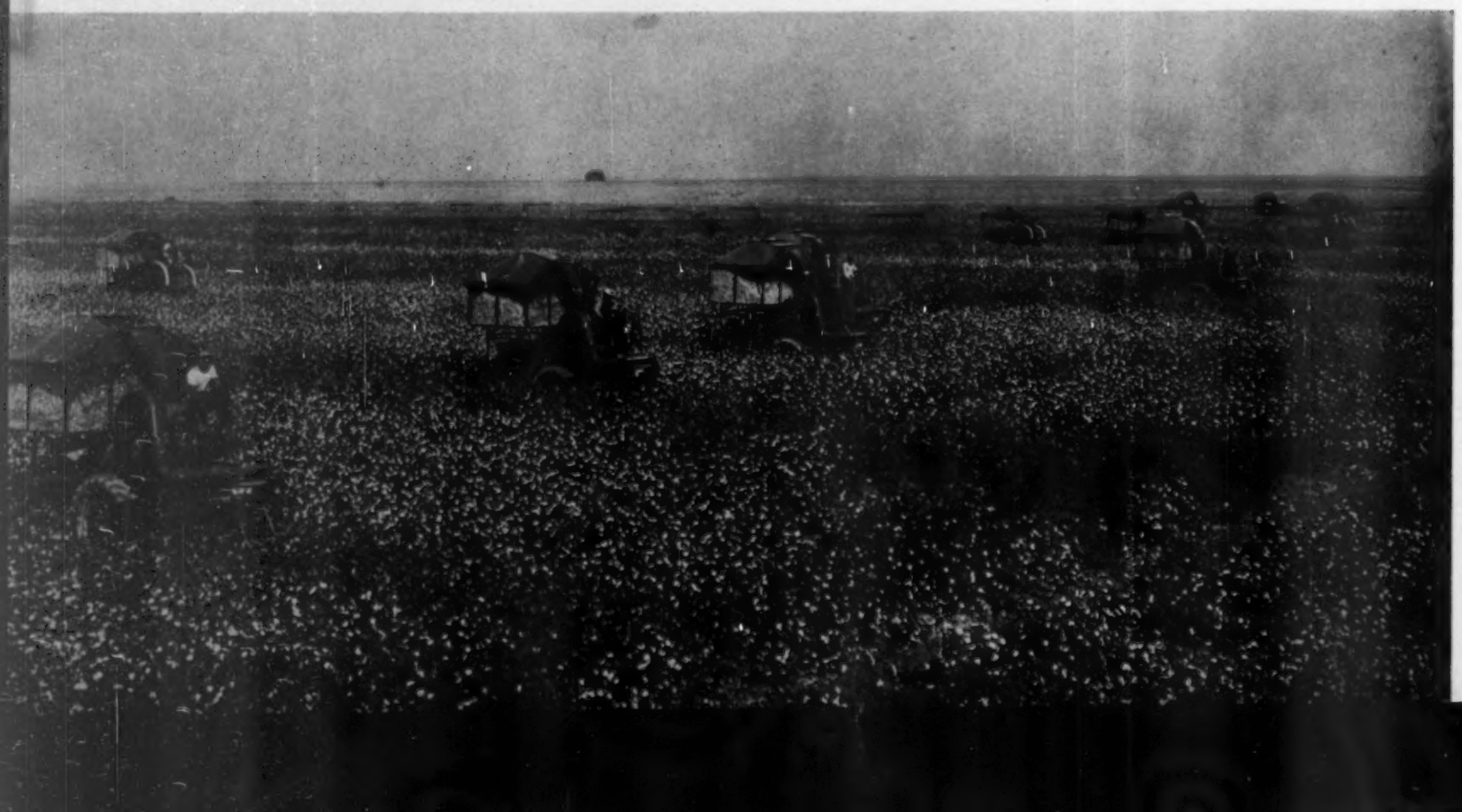
Allied Equipment Co. Arose Since War's End on Vision and Faith in International Dieselized Cotton-Grain-Cattle Farm Machine Service

By F. HAL HIGGINS

THREE years ago, the speaker of the day at the graduating exercises at California Polytechnical College pointed to a trio of young men with International Harvester Co. training and experience in the sales and service fields, who had, in three short years, risen to independence and community importance through joining a dealership in farm tractors and equipment. Since listening to this keen and well-informed speaker, the writer has wanted to visit the men behind the Allied Equipment Company, Inc., with headquarters at Fresno and branch stores at Five Points, Madera and Reedly for coverage of the two important cotton belt counties of Kings and Madera. This is the story told by these men who joined hands, capital and brains to make up Allied, to graduating students at the little "cow-plus college" in San Luis Obispo, nearly three years ago.

In 1946 four men went out and bought a retail farm machinery business that was for sale. They had to mortgage everything they owned, including their hopes of future salvation. But because they had slowly and carefully built their business knowledge and their business reputations, people loaned them money. For the same reason their factories gave them credit, and because their factories knew and believed in them, the banks also granted them credit. They took possession January 2, 1947. That

Beats the old "Field-hand and mule" system of cotton cultivation as practiced in the old South up to recent date. Here is an Allied Equipment Co. International MD cultivating after it has dropped off the planters. Later it will be saddled with the picker and run backward to do a year-round job of efficient mechanized cotton production that cuts costs to the bone and makes the skilled operators and sound managers of the irrigated cotton areas big profits in recent years.



About half the International cotton pickers are on diesels because the factory can't turn out enough diesels to make it higher, up to this post-war date. They are all trying to get them all-diesel in the California irrigated cotton areas.

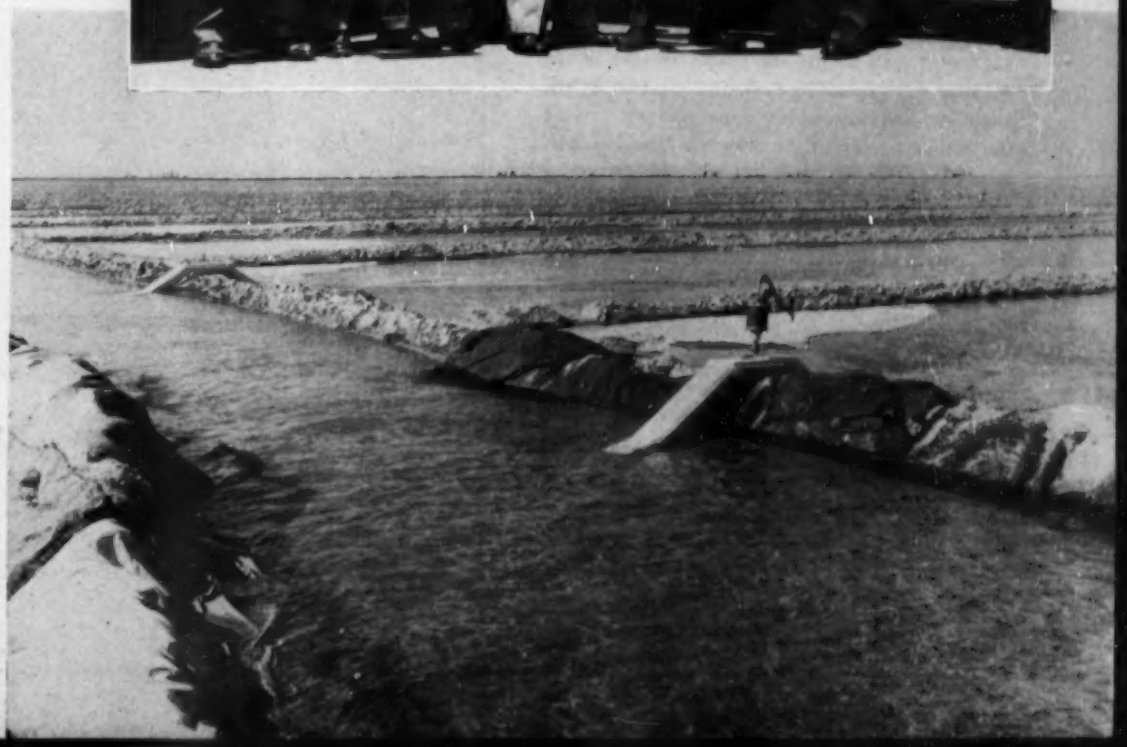
"Best dam tractor on this job!" claimed the operator when caught on the job at Pine Flat Dam in Allied territory. The tractor is a TD24.

first year they sold $1,842,776.00 worth of merchandise, paid themselves reasonable salaries, and had a net profit of $127,252.00. The next year, 1948, they sold $3,338,881.00, again paid themselves reasonable salaries and had a net profit of $414,799.00. In 1949, they sold $2,758,067.00 and had a net profit of $187,564.00 above their salaries. In three years they had made their salaries plus $729,615.00. After paying taxes, they still had left a net accumulation of $452,273.00.

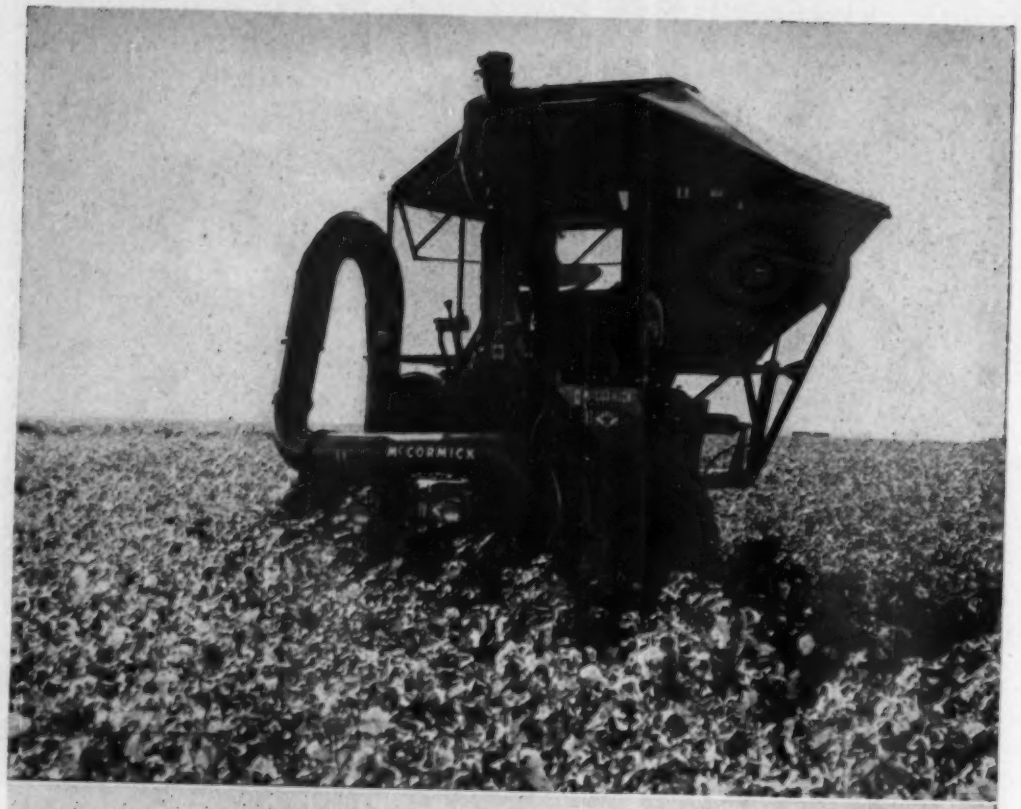
These boys are not at the top in the farm and industrial machinery business of this state, but they haven't done so bad in just three years. What they have done has been done by others in a greater or lesser degree, but not without long years of careful study, training and practice. The expanding San Joaquin west side farming, whose water problem was solved with canals bringing water from the new dams, has seen Allied Equipment and its three active partners march right in step with the demands of an exacting agricultural and industrial demand for service. The three partners are: Sales Manager M. C. Orendorff, Credit Manager "Gib" Caswell, and Parts and Service Supervisor "Ed" Ricks.

The writer found Mr. Ricks on the job in the block long headquarters building in Fresno. The latter wasted no time getting acquainted as he glanced out over the crowded floor where a giant 275 hp. Cummins powered wheel tractor from Mississippi was being tuned up for a big land levelling job to get more raw desert land ready for cotton, grain or alfalfa. Shortly afterwards a phone call from "Max" Orendorff, sales manager, told us we could meet him over at the Five Points Allied Equipment store. This is the latest addition to the expanding Allied service and the last word in effi-

Second from right is Ed Ricks, Parts and Service Supervisor of the Allied Equipment Co., as he learns from the factory men while teaching them some of the facts of International diesel equipment in the cotton, grain, oil and dirt-moving fields in his territory. This International Industrial Power service truck travelled all over the IH map with the equipment and instructors to take the factory story out to the dealers to get the most efficient service on the new models down to the grass roots where sales are made and cultivated into more sales from successful use. Second from left is Ed Smith, Fresno Shop Foreman for Allied Equipment.



Siphon handled by Allied Equipment IH dealer, Fresno and Madera. Vacu siphon, alfalfa flood irrigation.



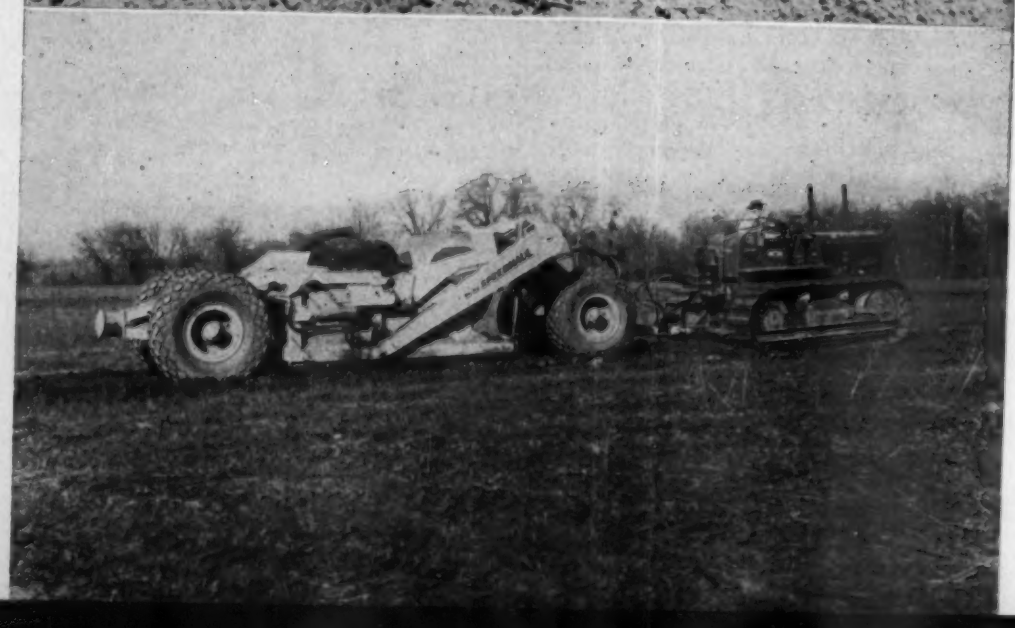
Just one of the 500-plus cotton pickers that Allied has sold and serviced into its two-county cotton kingdom of Madera-Kings area. About half of them are on the diesel MD tractors which do a year-round farm job, dropping off the picker after harvest.

cient International Harvester dealer farm service. Before driving out to Five Points, we looked over the lines of IH and allied equipment handled by this dealership. In the middle of the display floor, being tuned up for delivery was an MRS wheel tractor for fast handling of dirt on long hauls. The open-minded Allied men had heard enough about its work on the Mississippi levees to give it a chance to show its value on land levelling in their expanding west side cotton grain belt. They had already sold and delivered two units with Bucyrus-Erie carry scrapers teamed with the 275 hp. Cummins engines that powered the tractor.

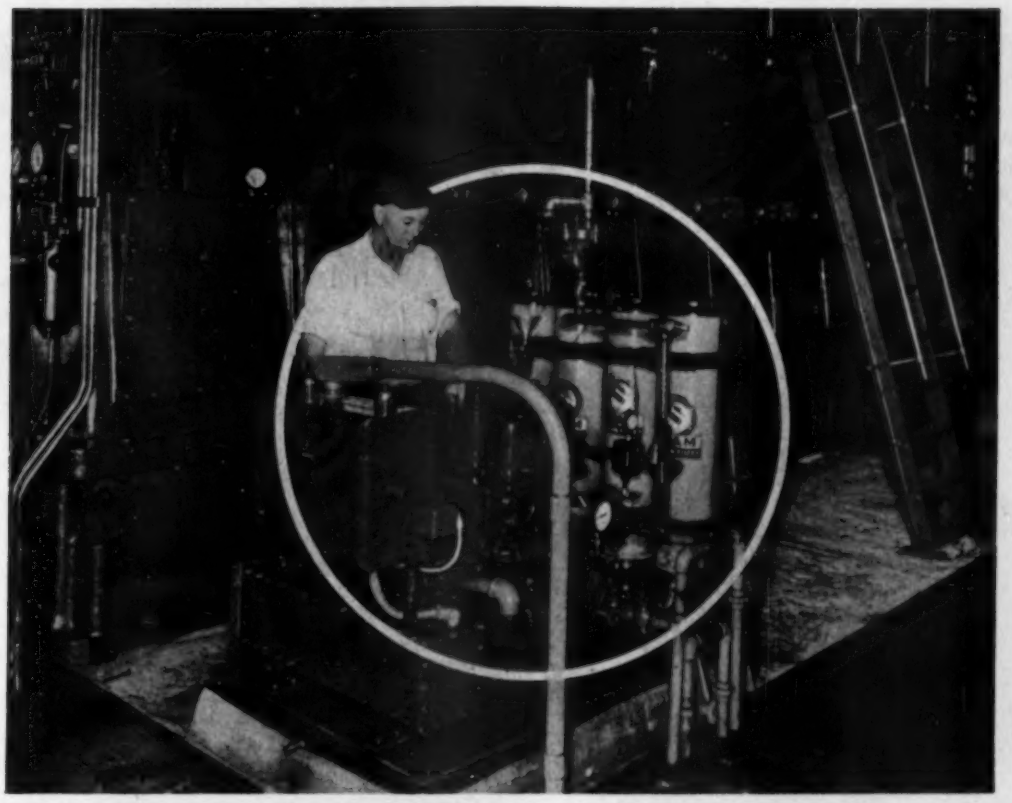
In an hour we were out to the land levelling job, within sight of the Five Points store. The fleet of tractors at work here included International TD 24's, TD 18's and the service truck that every big ranch has on the job to furnish diesel fuel, oils, greases and many more of the 200-odd oil field products furnished from both the larger and smaller oil companies. These are doing an incomparable service in keeping the valuable diesel gasoline, butane, propane and natural gas powered equipment going in top order. No other area in the world teams up such a smoothly operating mechanized service to agriculture, as does the farm equipment and the oil industries in this irrigated cotton-grain area of the west.

"Here comes Max now," said the Allied guide as he glanced up from the land levelling area where we had stopped to watch the MRS diesel pulling a Bucyrus-Erie scraper. The pilot of the little plane skimmed over the field, circled and dodged a surveyor's stake as he rolled up near the job, braked, got out and came over to greet the visitor. "How much does one of these MRS jobs with that scraper retail when you get it delivered to the owner?", the writer asked. Max figured on the back of an envelope and came up with an answer just short of $42,000. That will give the reader an idea of the scope of this expanding demand for power by the engineers and custom operators who are serving the cotton farmer in the lush San Joaquin west side, where the cow pasture of yesterday and today is the irrigated cotton field of tomorrow.

Lots of the IH MD's go into the California cotton fields because of their double-saving in fuel as they are used at such jobs as cotton planting and cultivating before harvest time when they "saddle up" with an IH cotton picker on their backs and operate backward instead of forward.



TD18 with Be-Ge scraper levelling land for more cotton and grain in Allied territory.



REMOVE DIRT AND WATER AND CARBON, TOO WITH THE DE LAVAL "PURI-FILTER".®

The De Laval "Puri-Filter" removes ***all three*** major contaminants of diesel lubricating oil: dirt, water and colloidal carbon. The first two are separated from the oil by centrifugal force in the bowl of the De Laval Oil Purifier—the water being discharged continuously. The colloidal carbon is then filtered out of the purified oil.

The De Laval "Puri-Filter" combines the De Laval "Uni-Matic"® Oil Purifier and Fram "Filcron" filters. Because the combination unit gets rid of all contaminants down to one micron in size, and also keeps the oil completely free of moisture, it is the most effective means ever devised for protecting diesel engine bearings.

● Write for additional details on the De Laval "Puri-Filter" for diesel lubricating oil. Ask for Bulletin DL-1.

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6

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THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL OIL PURIFIERS

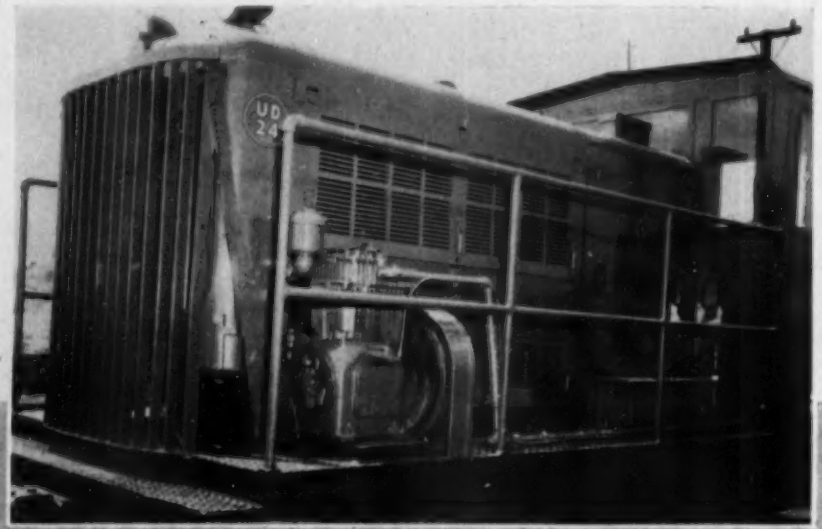
FOR DIESEL LUBRICATING OIL

STEAM TO DIESEL CONVERSION

FOUR wheels and the frame of an obsolete 1923 steam engine and an International UD-24 diesel power plant are the main components of a company designed and constructed locomotive now operating at the Lehigh Stone Company quarry, Kankakee, Illinois. Built under the direction of Del Groff, quarry supervisor, and City Industrial Engine Sales, Chicago, the total cost of the unit, which has 16,000 pounds draw bar pull at 1300 rpm., was $16,000, approximately half the cost of a new steam engine.

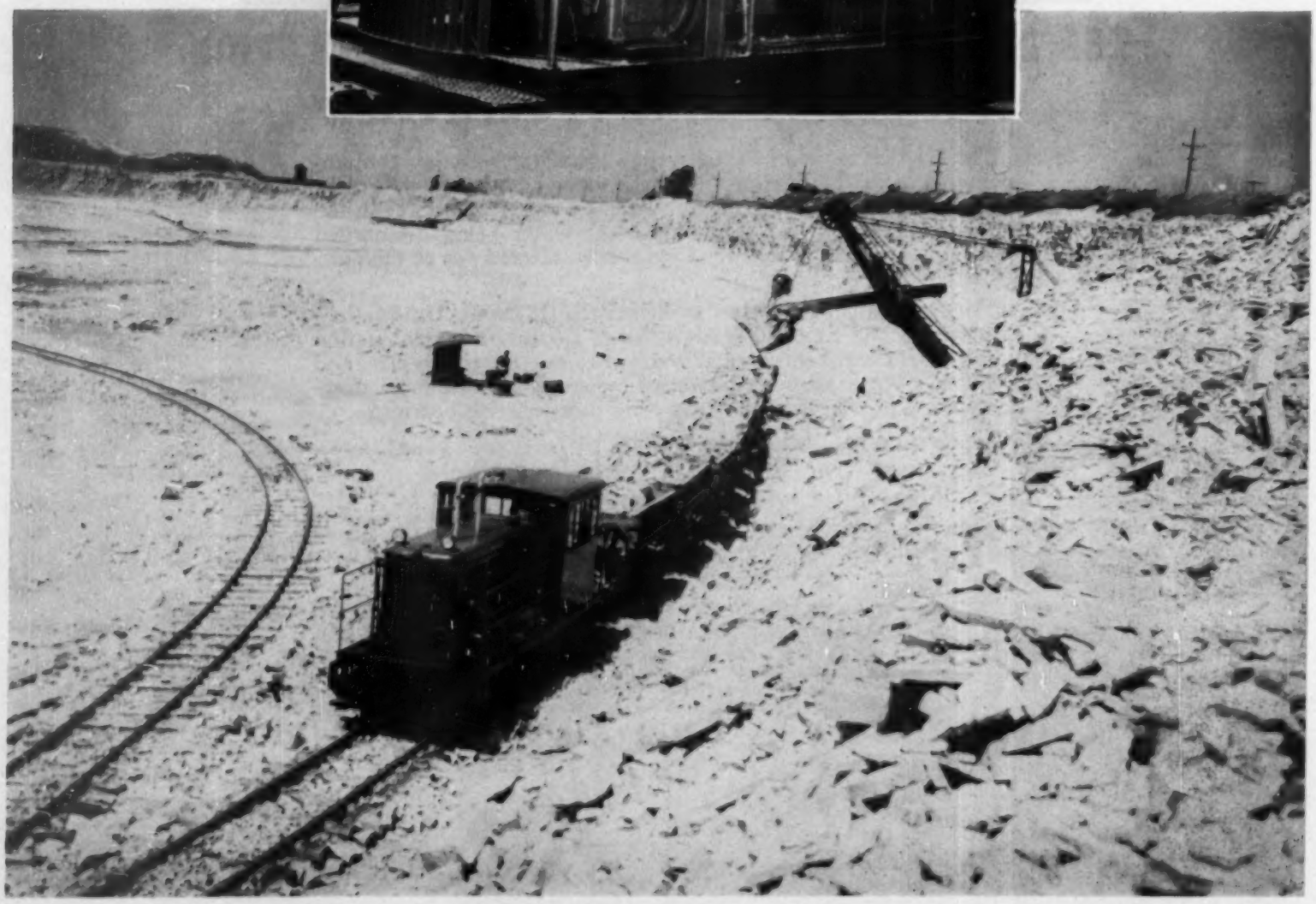
In converting the old steam engine, the UD-24 was mounted on the front portion of the frame. Power to drive the wheels is provided through a Twin Disc Torque Converter to a Davenport-Bessler transmission reduction gear. The air supply is furnished by a Quincy 34-cubic foot compressor attached to the left side of the locomotive and powered from the front pulleys on the UD-24 diesel. The operator sits on the right side of the cab which is connected immediately to the rear of the International power unit.

Pulling 10 cars totaling 150 tons (75 tons of stone and 75 tons of dead weight) it takes the engine 26 minutes to make the 1¾ mile round trip between quarry and crusher. Most of this time is taken up in the individual loading of each car. The engine has no trouble in pulling the loaded cars up the 2½ percent grade running from the quarry floor to the crusher level. Since initial tests show a cost of only $3.00 an hour to operate against $10.00 an hour for steam, Lehigh is converting two more units and will place them in service October.



The converted Lehigh Stone Company locomotive in front of its full load of 150 tons. Power is transmitted through a Twin Disc torque converter.

Close-up of the converted locomotive showing the Quincy 34-cubic foot compressor mounted on the left side.



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(2-CYCLE)

Can you do this with your diesels?

Within just 40 minutes you can remove a cylinder assembly — replace it with a complete new one — and have your P&H Diesel back in service.

No other diesel offers you such amazing speed and simplicity — such protection against costly lay-ups. Think what it can mean to you in time and cost savings — in simpler parts stocks. Where necessary, you can take an assembly from one engine to another . . . good reason in itself for standardizing on P&H Diesels.

This is only one of many advantages you'll find in this advanced line of P&H Diesels. Ask your nearest P&H Diesel representative for complete facts. Or write us.

P&H DIESEL DIVISION
HARNISCHFEGER CORPORATION
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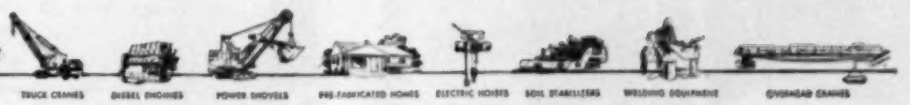
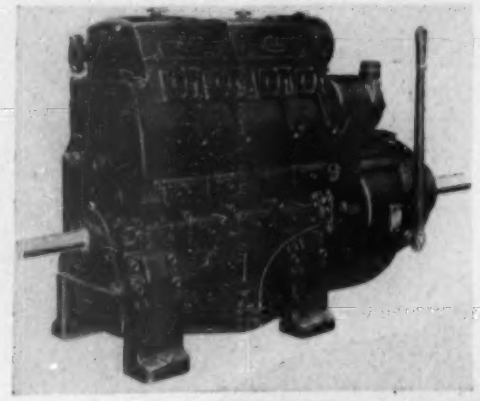
the P&H *Line*

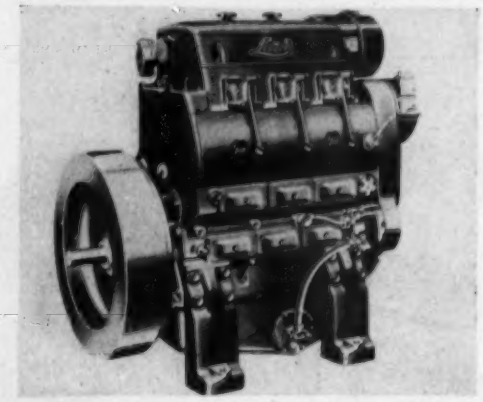


THE LISTER LINE

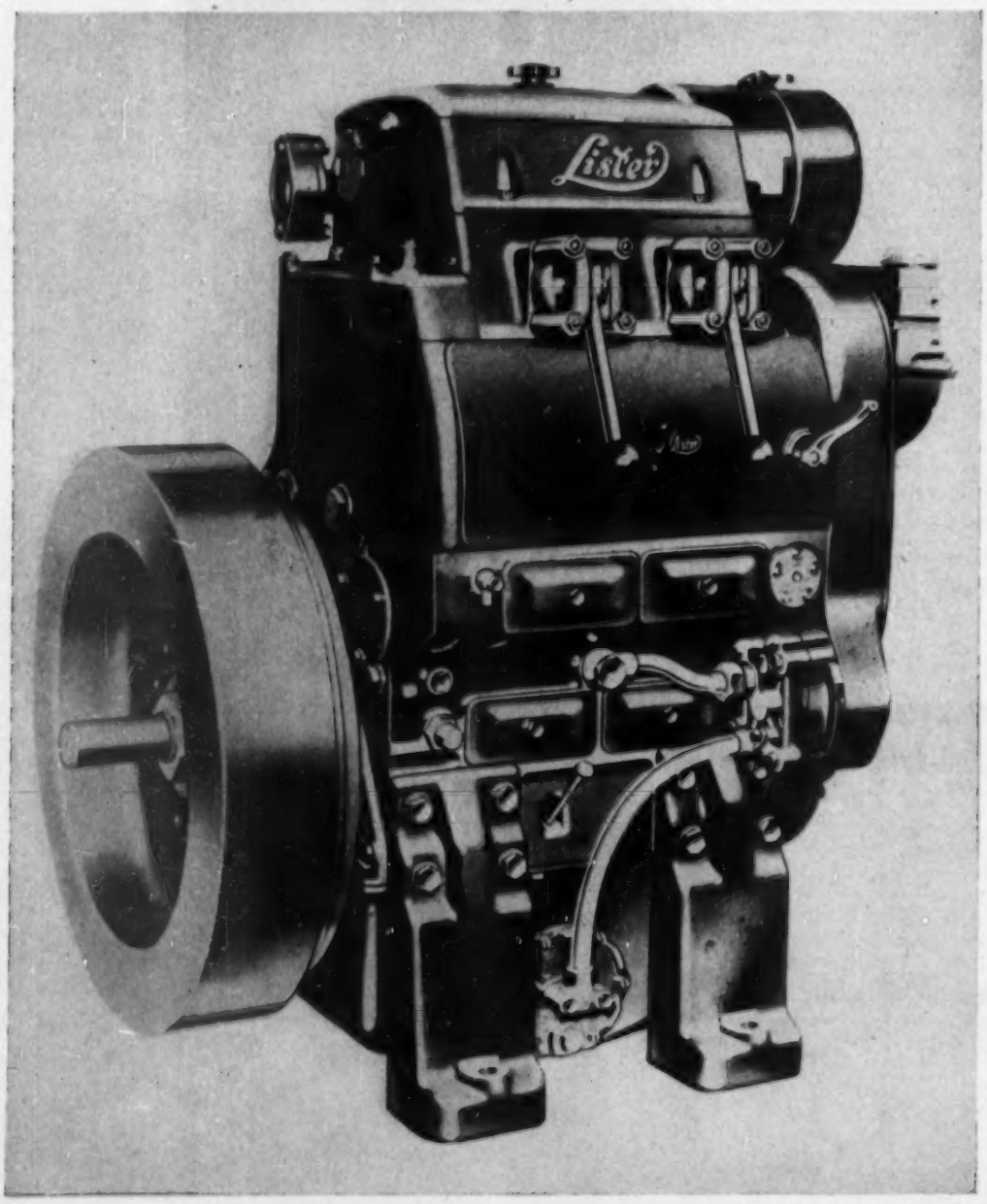
DESIGN features of the new "Freedom Range" of Lister diesel engines have been announced by the Engine Division of The National Supply Co. National Supply recently became the sole distributor within the Continental United States for Lister diesels. The engines are manufactured by R. A. Lister & Co., Ltd., Dursley, Gloucestershire, England. The FR line represents the culmination of a development program started prior to World War II. The Lister plant was extensively reorganized, with much new equipment installed, for their manufacture.

The engines, made in 1, 2, 3, 4 and 6 cylinders, in a range from 8 to 54 hp., were especially designed for operation at high speeds, and at tropic to Arctic temperatures, without impairing their standard of reliability. Each cylinder develops 9 hp at 1800 rpm., except the single cylinder engine (FR 1) which develops 8 hp. at 1500 rpm. Weight of the FR engine is approximately half that of earlier Lister diesels of the same power. The engines are totally enclosed, giving a clean exterior and providing protection for all working parts. All covers are easily removable for accessibility. A standard type of wet liner, chrome-hardened with a patented Listard process, has been adopted. In this electrochemical treatment, the cylinder surfaces are permanently impregnated with chromium, resulting in a perfect bonding of chromium into the pores of the cast iron. The chromium cannot peel off or become detached from the wearing surface of the cylinder, but actually becomes a part of it. This produces a wearing surface more resistant to corrosion, erosion and wear than any other method known. The crankshaft, connecting rods and bearings are unusually large for engines of this size and speed. The camshaft has also been given generous dimensions.





Top left: **The Lister FR 4 four cylinder engine which develops 36 hp. at 1800 rpm.**
Top right: **The FR 3 three cylinder engine which develops 27 hp. at 1800 rpm. and**
Below: **A blown-up photo of the FR 2 twin cylinder engine developing 18 hp. at 1800 rpm.**



The centrifugal governor provides close speed control, maintaining the "settled" variation within 2 per cent, while a fully-automatic release limits overloading to 10 per cent. Inspection and replacement of working parts can be carried out with a minimum of dismantling. A detachable sump gives access to all crankshaft bearings. The oil strainer is removable as a unit, thus providing a large hand hole for cleaning the sump. A gear-type oil pump is mounted externally, above the oil level, to make it readily accessible. Special provision is made to insure the instantaneous priming of the pump. A fuel filter of original Lister design is built in. A large capacity filtering element is wound in spiral form in a special container and the complete unit is housed in the settling chamber which forms part of the crankcase. Removal and cleaning of the filter element is simple. A large capacity air cleaner imparts a swirling motion to the air drawn in and by centrifugal action and suitable baffles deposits any foreign matter present in an oil-filled trough. A Lister patented air silencer reduces air intake noise.

To aid in standardization, an individual injection pump is provided for each cylinder, and is interchangeable with that of any other FR engine. The Lister dual combustion chamber, operated by a spring-loaded lever, gives a high compression ratio for easy starting and the lowest practical ratio for normal operation. The engine will operate with clean exhaust on no load as well as on full load by leaving the compression on the high ratio. This gives the additional heat required for complete combustion of fuel under all load conditions. The engines, upon arrival in the United States, will be equipped with American accessories, such as starters, generators, radiators, clutches, and marine gears. Parts for the engines are stocked by the National Supply Engine Division branches and dealers.

Why leading diesel engine builders say—

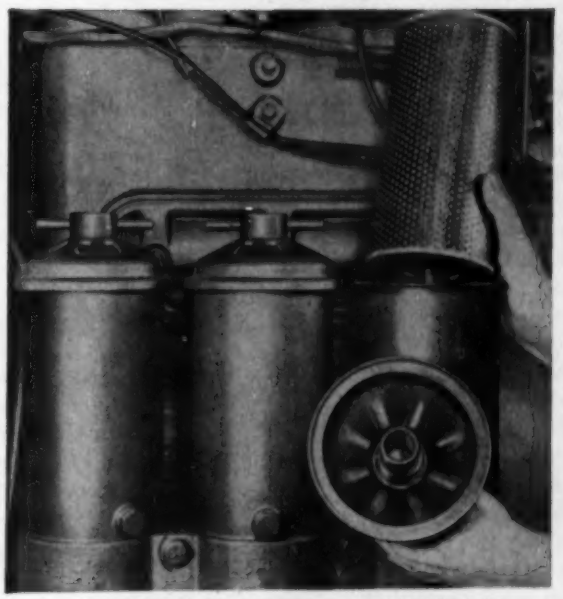
It's *Purolator** for Full-Flow!

- **Full-flow rates within practical filter dimensions:** Purolator's famous "accordion-pleated" Micronic* filter element has up to ten times more filtering area than old-style filters—gives high flow rates in a minimum of space.
- **Ultra-micronic filtration:** High flow rates are, of course, meaningless unless effective filtration is maintained, too. Electron micrographs prove that the Purolator Micronic filter stops particles down to *submicrons*—.0000039 in.!
- **Maximum dirt storage capacity:** The pleated design of the Micronic filter element provides many times more dirt storage space than old-style filters. This important advantage means uniform, efficient performance and a lengthy service life.
- **Minimum pressure drop:** The Purolator Micronic filter element introduces a remarkably small pressure drop in the lubricating system . . . permitting pumps of practical size and simple type.
- **Will not remove or absorb additives:** With Purolator Micronic filtration, you keep *all* the oil quality you pay for. The Micronic filter element will not strip additives . . . an important advantage with HD and heat-resistant oils

Modern engines with full-flow lube systems . . . which filter *all* the oil at each pass through the engine . . . demand the best in filters. And most leading makers of diesel engines and vehicles agree that the best is *Purolator** . . . a fact proved over and over by their own impartial tests.

The story's the same with gasoline engines, too! The world's best known producers of passenger cars, trucks, tractors, earth-moving equipment, and stationary engines have found Purolators best . . . and install them as standard factory equipment.

If you are contemplating new designs or modifications of existing ones, remember . . . there's a well-engineered and use-tested Purolator for *any* filter application, including fuel oil, gasoline, hydraulic fluid, and water. Write for the Purolator catalog issued for your special field.



Purolator Micronic Filters in a typical Diesel full-flow installation. Although the Purolator Micronic filter elements measure only 4½ in. by 9 in., *each one filters 9 gallons of oil per minute*, giving a total of 27 g.p.m. for the complete filter unit.

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Supervising & Operating Engineers Section

CONDUCTED BY R. L. GREGORY

A DISCUSSION OF DIESEL FUELS—PART II

CONTINUING our discussion of diesel fuels, let us look at the subject from the view point of one of the major oil companies, who furnish various types of fuels to the owners of diesel engines. They realized that diesel units are generally designed to operate on certain grades of fuel and as such follow the recommendations of the ASTM as to the type of fuel supplied to their customers, or shall we say, suggest that these types of fuel be used by their customers. For those not familiar with the ASTM recommendations they are herein given: Grade 1-D, recommended for engines requiring frequent load and speed changes. Grade 2-D, recommended for engines in industrial and heavy mobile service. Grade 4-D, recommended for engines in medium and low speed service.

We note that not much information or comment is made upon the use of the heavier types of fuel, most of which come under the category of Bunker C fuels. Perhaps this is due to the fact that it has only been in various recent years that supervisors and operators have seriously thought of using this type of fuel in diesel operation, and only then because, they desire to lower operating costs. And it has been a fact, that most diesels are not, or have not in previous years been adapted to using these heavy Bunker C fuels, and doing so efficiently. Of course one of the principal reasons for this is, that in selecting a diesel fuel, the fluidity of the fuel must be considered, as a very important point, which brings up the point of the atmospheric temperature at which the fuel system can handle the fuel. This is known as the pour point, and Bunker C fuels do not have a low pour point, and are very hard to handle in many instances at even average atmospheric temperatures. When we do attempt to use them we revert right back to the statement made in the previous discussion, that of adapting of the fuel and special handling in order to make the pour point low enough for pumping, injection and combustion purposes.

Viscosity and pour point determines the fluidity of a fuel. Most fuels are either of a naphthenic or paraffinic base. Naphthenic base fuels contain no wax, hence viscosity becomes the determining factor, while paraffinic fuels generally contain a percentage of wax and in such a fuel, pour point is the determining factor. Many fuels such as the Bunker C fuels carry a high percentage of asphalt, which congeals even in moderate temperatures and hence the fluidity is such that they are hard to handle with the average injection system unless by preheating and treatment they can be made fluid enough to handle properly. The average fuel injection systems, particularly the fuel pumps, will not properly handle fuels which are more viscous than 550 seconds Saybolt. This means that preheating and special handling must be applied to fuels that are more viscous than said 550 seconds Saybolt. The following tables give some idea of the pumpability of both naphthenic and paraffinic fuels.

Naphthenic Base Fuels

Low temperature limit for satisfactory pumpability	Approximate Viscosity Sec. Saybolt at 100° F.
20°F below	42 seconds
0°F	50 seconds
20° above	65 seconds
40°F above	98 seconds
60°F above	160 seconds

Paraffinic Base Fuels

Pour Point	Low temperature limit for satisfactory handling	Viscosity Seconds Saybolt at 100°F
30°F below	20°F below	32 sec.
0°F	10°F above	38 sec.
30°F above	40°F above	42 sec.

As you will note, fuels containing wax have a higher pour point than those without wax of the same viscosity, due to the separating and solidification of the wax, and since the wax starts separating out above the pour point, the flow through filters equipped with fine screens or cloth will be impaired when the temperature of the fuel reaches 10°F above the pour point. Some years ago we tried a certain fuel of paraffinic base in our large slow speed units, and while this fuel gave us fairly efficient results, we were hampered so much by the collection of wax on our filters in the fuel lines, that it was necessary to clean these filters every two or three hours in order that we could successfully pass the quantity of fuel required by the engine through the filters. At that time we were preheating the fuel to approximately 120°F and the only way that we could eliminate this condition was by preheating to even higher temperatures than we did when using other types of fuels.

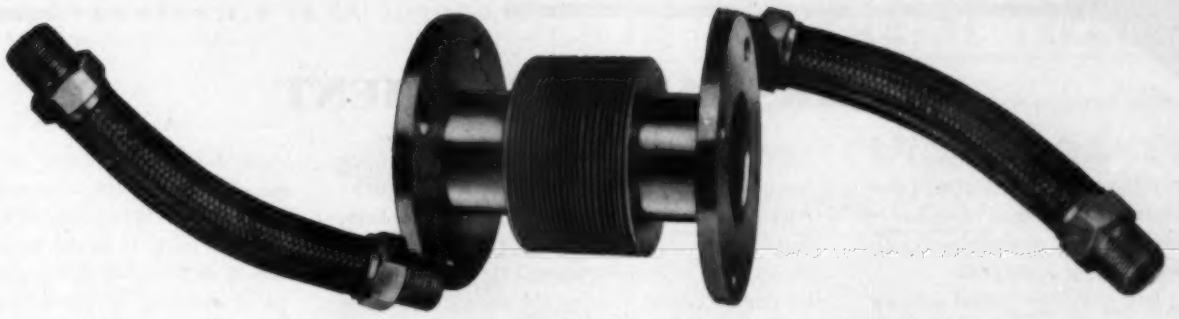
Most manufacturers suggest a minimum viscosity of from 35 to 40 seconds at 100° F to insure proper handling of the fuel injection equipment, and it will be noted that by comparison, at 0°F, a paraffinic based fuel of 38 seconds would have to be used while a naphthenic fuel of 50 seconds would be satisfactory. Hence the conclusion is that a naphthenic base fuel which is of higher viscosity for the same pour point is superior to a paraffinic base fuel from the standpoint of injection equipment. Those of us who have used both types of fuels, do know that paraffinic based fuels have better ignition qualities. Hence as this refiner points out, the problem becomes one of blending various types of fuels to get the proper balance between the pumping action, lubrication and ignition characteristics.

As stated in the previous article on this subject, if the only objection to using these heavier and cheaper fuels in the Bunker C class is the point of fluidity, this can be overcome by higher preheating through the installation of heating equipment. This may be accomplished by the use of steam coils, hot water coils wherein the water used in the coils for heating the fuel is heated by means of a closed system, circulating said water through heating coils in the muffler, or by electric heaters. However, there is one point to be noted in any heating element of this nature and that is to see that sufficient area of the coils is supplied so that the temperature of the surface of the coils does not get much above 150-155°F. If the surface temperature rises above this figure, there is a possibility that the heating effect of the coils will be diminished due to carbonization of the oil on the heating surface of the heating coils in the fuel. This condition has often arisen in plants where the heating surface of the coils was insufficient and in trying to increase the heat content of the fuel, the fuel has become carbonized on the surface of the heating coils and destroyed the efficiency of the coils. The above condition is particularly true in the heavier types of oils known as Bunker C grades, since many of them do contain these high percentages of asphalt, which tends to build up carbon when excess heat is supplied to a coil with limited area.

The viscosity of a fuel is of vital import in diesel operation and is often limited by the fuel handling equipment. The fuel oil actually serves two functions, not only as a fuel but it must also have a certain amount of lubricating qualities to lubricate the intricate parts of the fuel injection system such as the pumps and delivery valves. Actually about the only lubricant that these parts obtain, comes from the fuel itself, and if proper conditions are to be maintained in this lubrication of the fuel injection apparatus, the fuel should be more viscous than 35 seconds at 100°F. When a fuel is used that is much below 38 seconds at 100°F you will often find a rapid increase in the leakage at the pump and a dribbling action at the injector nozzles. And any operator who has experienced these difficulties is well aware of such an effect upon the operation of his units, since the proper combustion is not obtained with such conditions.

. . . and now please turn to page 64 . . .

Are these 3 new to you?



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This is **TITEFLEX®**—*the* All-Metal Flexible Hose with 1001 industrial applications. It withstands temperatures, pressures, vacuum, vibration and the corrosive action of a host of liquids and gases. How can you use it? To connect moving parts of machinery. To connect misaligned parts. To absorb vibration, contraction, expansion and pulsation. To "transmit" vacuums or convey high-frequency currents. To shield wire and cables. And to handle difficult materials—from acid and ammonia to sea water or steam.

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TITEFLEX BELLOWS are the *efficient* means of absorbing lineal movement in many types of equipment. Their welded, convoluted-diaphragm construction lets them do this without weakening the lines in which they are inserted and without reducing the flow rates of gases or liquids being conveyed. You can use TITEFLEX BELLOWS to seal high pressure valves and shafts, accommodate lineal contraction and expansion or high frequency vibration, and to handle gases and corrosive liquids under high temperature conditions. Special designs are available and complete bellows assemblies can be furnished with any required types of fittings.

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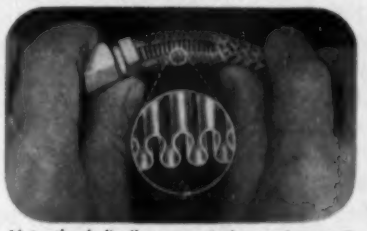
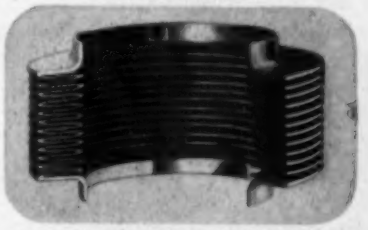
Sectional view shows rugged, flexible, seamed construction of Titeflex.



Note the helically-corrugated, seamless wall structure of Uniflex.



Cross-section shows the welded, convoluted-diaphragm construction of Titeflex Bellows.

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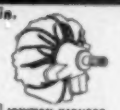

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CONDUCTED BY R. L. GREGORY

CRANKSHAFT ALIGNMENT

DURING the past week, this department received a letter from Mr. S. W. Newell, vice president of the Union Diesel Engine Company of Oakland, California, a portion of which we quote:

"Was surprised to find how little factual information there is concerning alignment of crankshaft and shafting. We have endeavored to locate information on this subject from American manufacturers and found that most dodged the issue by making a few general remarks such as 'equipment shall be properly aligned,' or something of the sort. As a further effort to investigate this matter more thoroughly we wrote to the British Motorship in London. Was surprised to find that they had no record of any such data being available."

Perhaps an explanation by the writer might be in line in answering Mr. Newell's inquiry and letter. In the past this department has from time to time received requests and comments from various readers of DIESEL PROGRESS, on individual problems and subjects in which they are interested. Some of these inquiries have been on the above subject and as most of our readers realize, one man's problems may be another's meat in which he is not at all interested. It being our policy to edit as far as possible only material which is of general interest to all our readers, this department has adopted a policy of answering specific inquiries from our readers by a personal letter, and insofar as we are able to try and help that reader with his problem. Several years ago, the writer did present an article on "Crankshaft alignment" and discussed it to some length, and while he did not go into fullest details, since there is a lot of information which can be given and said on this subject, he did give the more important factors on the subject at that time. Since then we have many new readers who are probably not aware that the subject has ever been discussed in this section.

As stated above, Mr. Newell feels that American manufacturers sort of "dodge" this issue and perhaps your writer can give a partial explanation at least for this situation. In the first place I do believe that it is not the intent of any manufacturer to dodge as important a phase of mechanics as that of crankshaft alignment. They all realize the importance of this factor in good engine operation. It is one of the basic musts, that every erector and service man must master before he is allowed to go into the field to erect and service units.

Your writer having been an erector and service man for several years, can well recall this basic principle was stressed to the beginners in this line of work, and the hours of labor and effort involved in mastering this phase of erecting jobs as well as checking equipment on overhaul jobs. I therefore believe that most manufacturers feel that as long as their erectors and service men are well versed and drilled on this particular phase of the work in handling their particular equipment, that that fact is sufficient to their ends, and hence do not want to take time to go into details in explaining the points involved to someone outside of their organization and hence pass the subject off rather lightly.

Your writer heartily agrees with Mr. Newell that more factual information should be available, not only on the subject of crankshaft alignment but many other subjects having to do with diesel operation. The world seems to be moving too rapidly to consider these points, and where a couple of decades ago, volumes of information was available on units, nothing very factual is available now, they just haven't the time to be bothered. I could give you dozens of specific instances to prove this point. But to get back to the subject matter, Mr. Newell has supplied this department with some basic information on crankshaft alignment which we are going to quote verbatim from his letter and then add a few comments of our own.

Alignment of equipment must be done most carefully. Correctness of all alignments should be verified prior to proceeding with installation work. Verification of correctness of alignment is customer's responsibility. Crankshaft alignment indicator is a valuable instrument for use in connection with this work. It should be used during installation as well as after the engine is in service. Frequent checking is always essential. Crankshaft alignment indicator is essentially a micrometer gauge specially designed to indicate the slightest misalignment of crankshaft by measuring deflection of crankwebs. Instruments are available which are applicable to any size Union diesel.

The lining up of a crankshaft and its connecting shaft is of prime importance in view of the fact that if the shaft is not in line, the webs of the crankshaft will deflect inward and outward during each revolution of the shaft. These repeated deflections set up stresses that may ultimately cause fracture of the shaft irrespective of its relative strength or size of the webs.

Refer to the following illustrations. Crankshaft should be properly contacting all main bearing shells.

1. Tentatively align and secure both engine and driven unit. Manually rotate engine so that crankshaft throw nearest the flywheel is located as shown in position 1. Place crankshaft alignment indicator between crankwebs as illustrated.

2. Manually rotate engine slowly. Note and record

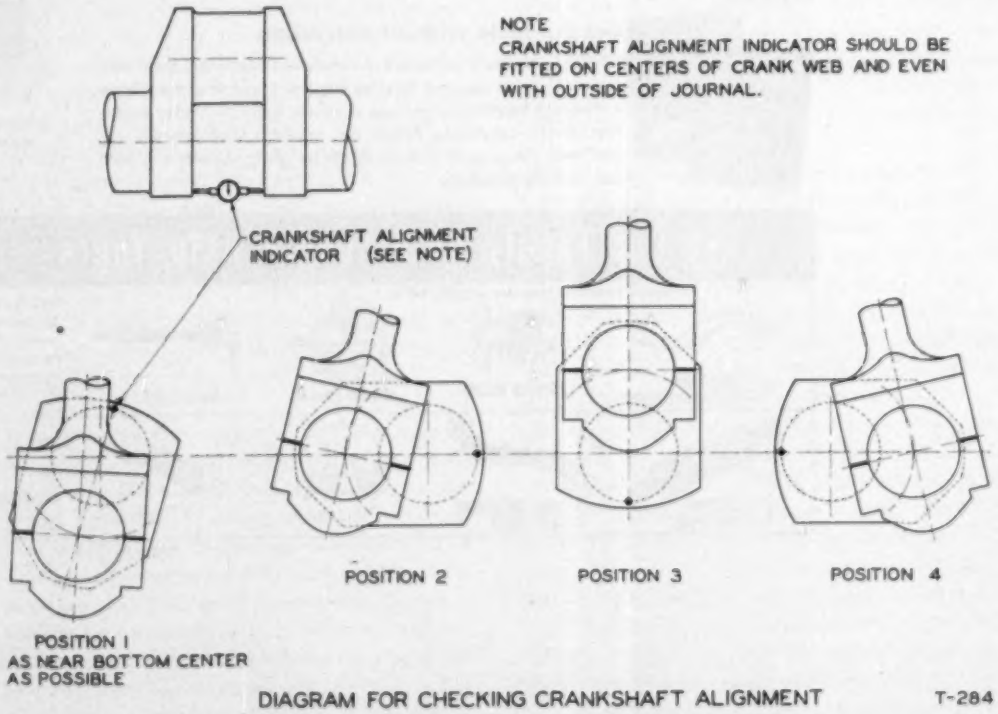
NOTE
CRANKSHAFT ALIGNMENT INDICATOR SHOULD BE FITTED ON CENTERS OF CRANK WEB AND EVEN WITH OUTSIDE OF JOURNAL.
CRANKSHAFT ALIGNMENT INDICATOR (SEE NOTE)
POSITION 1
AS NEAR BOTTOM CENTER
AS POSSIBLE
POSITION 2
POSITION 3
POSITION 4

DIAGRAM FOR CHECKING CRANKSHAFT ALIGNMENT T-284

alignment indicator gauge readings at the four positions corresponding to those illustrated.

3. Adjust alignment and recheck deflection. Repeat procedure until satisfactory alignment has been attained.

4. When the driving alignments are correct, similarly check alignments for all crank throws. Adjust as necessary until satisfactory alignments have been made.

5. If the range of all deflection readings is less than .002 in., the crankshaft is satisfactorily aligned.

When the crankweb deflection on all crankwebs is satisfactory, firmly tighten all foundation bolts on both engine and drive. Recheck deflection of all crankwebs to make certain that the final tightening has not upset the alignment. End of quote.

Writer's Comment: The foregoing instructions as given by Mr. Newell are the basic methods and principles involved in crankshaft alignment. However, there is considerable more to the procedure of proper installation and checking of crankshaft alignment than he has herein stated. To properly secure correct crankshaft alignment, one must begin with the alignment of the bedplate. The proper leveling of the bedplate, proper placing of the leveling shims and the securing of as near a perfect leveling of the bedplate (with the crankshaft in place in all main bearings) is most important. Of course this checking of crankweb deflection must go hand in hand and be a part of the baseplate leveling. Particularly is this true on long bedplates and especially those of sectional design.

We all realize that for a good operating unit an engine must be properly aligned and since alignment of functional parts and the unit as a whole depends primarily on the proper leveling and alignment of the bedplate, proper tension on all foundation bolts, proper tightness of all shims and above all proper grouting, the writer believes that every consideration should be given to both crankshaft deflection and bedplate leveling when erecting a unit.

Now one will often find that after a unit has been operated a while that a check of the crankweb deflections will show some change. There are several causes for these changes and if this deflection is too great, the causes for these changes must be determined and corrected. However, we do agree with Mr. Newell that periodical checkups of the crankweb deflections are most vital, particularly in large units with long bedplates and units which are subjected to severe strains and stresses caused by heavy loading.

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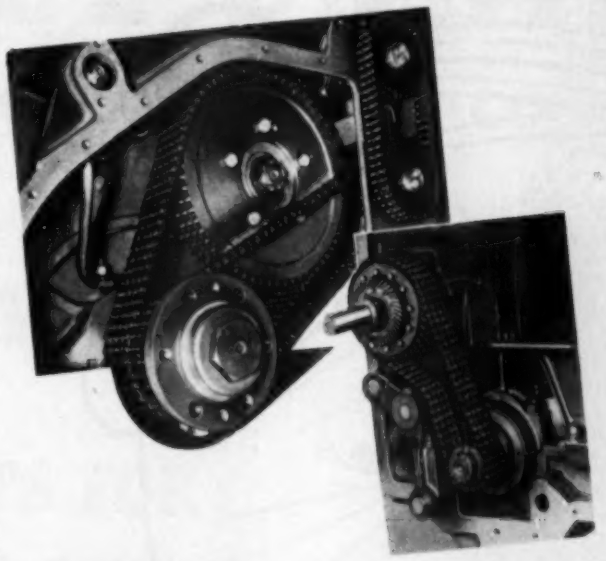

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Supervising

. . . continued from page 60 . . .

Those of us who have operated either solid or air injection units are aware of the importance of atomization and since viscosity of a fuel effects the size of the fuel oil droplets, it does play an important part in correct atomization and the pattern of the fuel spray. We also know that when you use too viscous a fuel you are likely to run into a smoky exhaust due to the fact that the fuel will not properly break up for the right atomization. On the other hand there is danger of running into poor atomization where too light an oil is used, since in this instance the fuel does not penetrate to a degree that gives proper atomization. Thus it follows that on an air injection unit a more viscous fuel can be used than on a solid injection unit, since the air injected helps in atomization of the fuel.

In solid injection units most of the atomizers are multi-holed to assist in breaking up the fuel. Of course it is important to ascertain the proper number of holes and the correct size of these holes in the atomizers used and a variance of .002 to .003 in. in the size of these holes often will make a vast difference in atomization. In the air injection unit where a needle valve is actuated, the size of the single orifice admitting fuel to the combustion chamber is important. Should the flame plate holes become enlarged from constant use, the combustion characteristics will vary. The same is true on the multi-holed nozzles of a solid injection unit and these nozzles should be checked periodically to ascertain that they are not becoming worn or enlarged to a degree affecting proper atomization.

In a coming issue we will continue this discussion on fuels from the viewpoint of the refiner and discuss characteristics which should help you in selecting the proper fuel for your units.

DEMA Educational Director

Robert L. Stanley

As of February 16th, Robert L. Stanley joined the staff of DEMA on a full-time basis as educational director. He was with the association in this capacity for a period of about six months two years ago and has, since then, served on a part-time basis in a consulting capacity. He received his bachelor of mechanical engineering degree from Ohio State University and his master of science degree from Rutgers University.

Mr. Stanley has taught at Union College in Schenectady, N.Y., and was later an assistant professor there. Since 1947, he has been associate professor of engineering research at the Pennsylvania State College where he has been engaged in various phases of diesel engine research. He is a past chairman of Mohawk-Hudson Group, Society of Automotive Engineers, and Central Pennsylvania Section, American Society of Mechanical Engineers.

Mr. Stanley's background will enable him to bring real practical help to educational institutions interested in diesel engine educational programs. Most of his time will be spent with college professors who teach courses in the diesel field. In carrying out his work, he will visit as many schools as he can include in his schedule. On such visits he will be glad to meet with any students who want information or advice about the possibility of going to work in the diesel field after graduation. In order that the school visited may get the most out of his call, a staff meeting of all mechanical engineering professors should be arranged early the day of his viist for an overall informal discussion.

General Sales Manager

Francis L. Schmale, formerly assistant sales manager, has been promoted to general sales manager of the Double Seal Ring Company, of Fort Worth, Tex., according to Wm. T. Green, vice president and general manager. The appointment was effective Jan 1. The new sales director for Double Seal joined the company's sales organization in March, 1947. Prior to that time, he spent five years in the Air Force, leaving the service with the rank of captain. Mr. Schmale is a native of Kansas City and attended the University of Kansas. He is a member of the Fort Worth Sales Executives Club and resides in Fort Worth with his wife and son, Richard Leland, 5.

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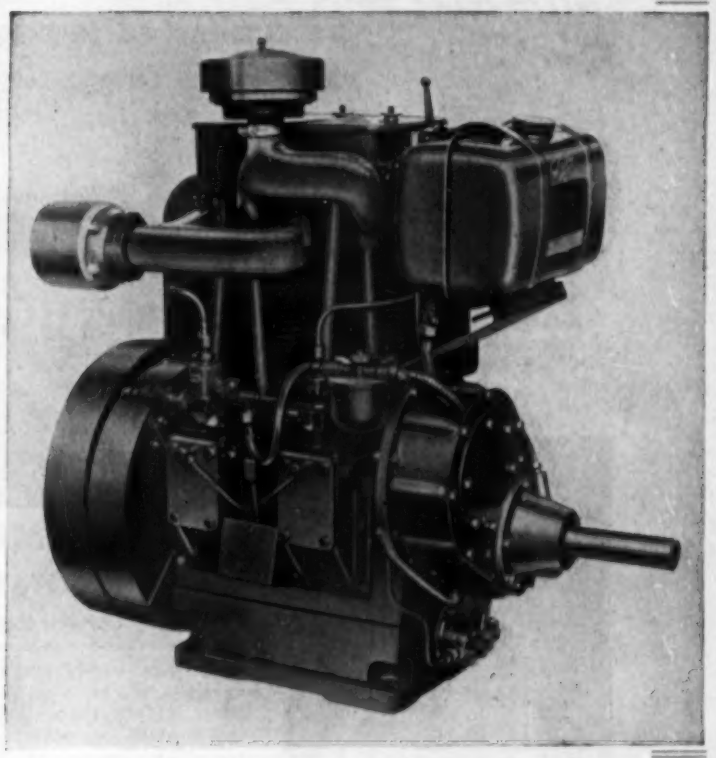

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Packard Diesel Appointments

J. P. Ostrander

New appointments have been made in Packard Motor Car Company's Defense Operations division in an expansion move to further extend the company's diesel engine business, George H. Brodie, vice president of Defense Operations has announced. William H. Klenke, Jr., 43, has been appointed assistant to the vice president of Defense Operations, and J. P. Ostrander has been named manger of marine and industrial sales.

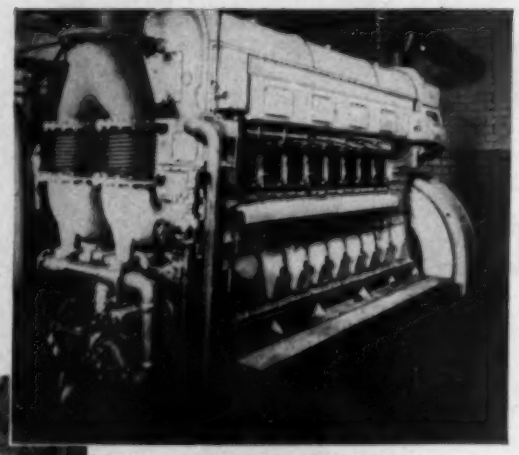
Mr. Klenke, with experience in government operations, will be responsible for sales to present government customers, and promotion and sales of all products of the division. He was formerly general sales manager of Stinson Division, Consolidated Vultee Aircraft Corporation. A colonel in the Marine Corps Reserve, he holds the Air Medal from World War II.

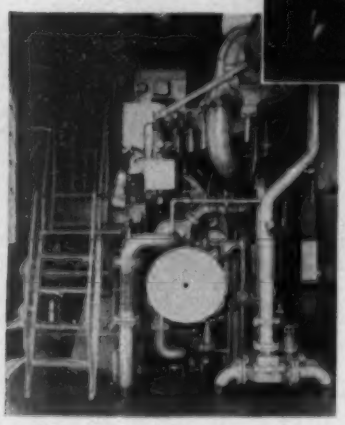
Mr. Ostrander, 40, heads the newly formed marine and industrial sales department which will handle commercial sales of diesel products. He was formerly a special sales representative in the diesel engine industry, also was with the Bendix Corporation. Both men report directly to Mr. Brodie in the new activities.

WHENEVER rigid piping or ducts must be connected to engines...

CMH Flexible Metal Hose at work on diesel exhaust connectors on a Fairbanks-Morse engine.

Below — at work as coolant water hose on a Nordberg diesel.





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FLEXIBLE METAL HOSE

CMH Flexible Metal Hose absorbs engine vibration—isolates the forces that damage rigid piping and loosen exhaust, oil, air and fuel connections. It is also the most economical and dependable method of eliminating piping stresses that result from misalignment or expansion and contraction.

CMH Flexible Metal Hose is available in a wide range of types, sizes and assemblies to meet your needs. Distributors are located in all principal centers. See your classified telephone directory or write for the name of the distributor nearest you.

HERE'S YOUR GUIDE TO MOTION CONTROL

For helpful information on motion control, Write for Bulletin 124.

CHICAGO METAL HOSE Division

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Manufacturers of flexible metal hose and conduit, expansion joints, metallic bellows and assemblies of these components.

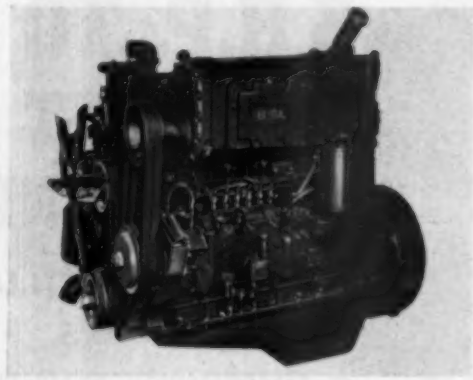
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

Flexon identifies CMH products that have served industry for over 50 years.

New Compact 165-hp. Diesel

The Buda Engine Company has just announced the development of a new 165 hp. diesel engine that is especially suitable for heavy-duty trucks and tractors hauling up to 60,000 lbs., G.V.W. This Buda diesel is known as Model 6-DAS-516. It is a 4 cycle, 6 cylinder heavy-duty built, high speed engine that is very powerful – developing 165 hp. at 2400 rpm., and a maximum torque of 402 ft. lbs. at 1600 rpm. The engine is compact and light in weight and will go into any standard or C.O.E. truck or tractor chasis normally used for heavy hauling of intercity or over-the-road freight.

The new model 6-DAS-516 diesel is a supercharged engine and has a displacement of 516 cubic inches, with a bore of 4⅞ in. (112.6mm) and a stroke 5⅝ in. (141.3mm). The overall dimensions are: length–47½ in.: width–32½ in. and height–48⅛ in. The engine is such that it wlil mount in a 28 in. wide truck frame. Overall weight of the engine, including 12 volt electrical equipment and 7¼ cu. ft. air compressor, is 1825 lbs. Fan to flywheel weight of engine, less electrical equipment and compressor, is 1625 lbs.

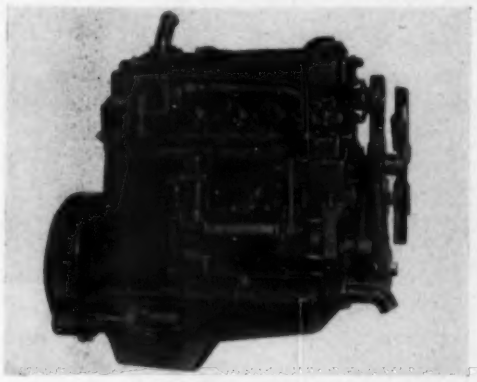


Injection side of the new Buda engine, showing the Pesco supercharger, American Bosch fuel injection pumps and Fram fuel filter.

The engine is designed to approach quarter-million-mile operation before overhaul. The outstanding construction features of this diesel are: "Tocco" hardened special open hearth steel forged crankshaft, fully counterbalanced with twelve counterweights for smooth running. Diameter of seven main bearings 3½ in. each. Torsional type vibration dampener mounted on front of crankshaft. Cylinder heads of alloyed cast iron with replaceable exhaust valve seat inserts and special mono-lobe dyna-swirl combustion chambers. Reinforced heavily-ribbed crankcase and cylinder block equipped with removable cylinder liners of the wet type.

Pistons are of trunk type, aluminum alloy with five rings, all above piston pin. Two valves to each cylinder located in cylinder head, exhaust valve of silicrome XB stem and austenitic steel head. Fuel system with positive operating mechanical fuel injection pump, controlled by governor mounted integral with pump. Nozzles of pintle type, fully self-cleaning; one per cylinder. Injection of fuel is by horizontal spray, parallel with piston head . . . fuel spray does not strike pistons or cylinder wall . . . nozzles are easily removed for inspection

Positive displacement type supercharger operating at relatively low speed assuring long life and very low noise level. Supercharger is belt driven. Full circulating oil pressure system to crankshaft bearings, camshaft bearings, connecting rod bearings, valve rocker arms and timing gears. Wet sump lubricating system with gear type oil pump located in crankshaft sump and spiral gear driven from camshaft.



Exhaust side of the Buda 6-DAS-516 automotive diesel showing Leece-Neville generator and starting motor, Ross lube cooler and Bendix-Westinghouse air compressor.

In actual test installations, the Buda 516 diesel in trucks has a road performance that is remarkable. Fuel consumption (after road performance test of 150,000 miles) is between .40 to .47 lbs. per bhp. hour (approximately 4 to 6 miles per gallon capacity loaded). This 516 supercharged diesel is equivalent to a 600 to 650 cu. in. gasoline engine. The diesel engine will handle any of 60,000 GVW highway trucking loads where the top and average speeds are below the usual high speed load transport limitations. For best performance, the normal cruising speed of the truck should be set at approximately 2100-2200 rpm. engine speed and the gear ratio worked out so as to obtain the desired road speed at this engine rpm.

List of Equipment

Fuel Injection—American Bosch.
Supercharger—Pesco.
Fuel Filter—Fram.
Starter—Delco-Remy.
Lube Oil Filter—Purolator.
Lube Oil Cooler—Ross.
Air Compressor—Bendix - Westinghouse.
Vibration Damper—Houde.

New Product

Magnus Chemical Company, Inc., Garwood, N. J. announces the marketing of Magnus Waterless Hand Cleaner. While primarily for use where water is not convenient or available, this product is water soluble. It rinses thoroughly, leaving dirty hands clean, with no oily residue. When water is not available it may be wiped off with a towel, leaving the hands soft, without a tacky feeling. Containing no alkali, it is neutral in its reactions and will not irritate or dry out the skin. Complete information about this product may be obtained by writing to Magnus Chemical Company, Inc., department DP, Garwood, N. J.

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GE Built Electrical Equipment for Over 1000 Locomotives in 1952

The General Electric Company supplied electrical equipment for more than 1000 diesel-electric locomotives during 1952, according to G. W. Wilson, manager of the company's Locomotive and Car Equipment Department in Erie, Pa. These electrical equipments, comprising motors, generators and control, were made for both railroad and industrial-type locomotives. Despite production losses resulting from the steel and American Locomotive Company strikes and further government cutbacks in materials, Mr. Wilson pointed out that this year "has been a good year in the locomotive business." Although down about 10 per cent over 1951, he said that production is well over what is considered an average year.

Highlighting the department's activities for the year, Mr. Wilson pointed to the sale of 15 additional gas turbine electric locomotives to the Union Pacific Railroad. The Union Pacific has six gas turbines in operation of a previous order of 10. These six were delivered during the first part of the year and the remaining four will be delivered in 1953. Delivery on the newest order for 15 will begin in 1954. The company will build 10 rectifier locomotives, an all-electric type of motive power which utilizes large rectifier tubes in converting alternating current to direct current, for the New York, New Haven and Hartford Railroad. This will be the largest application of rectifier locomotives in this country. Eighty-three road switcher locomotives, to serve a wide variety of uses in both foreign and domestic applications, were ordered by the Army Transportation Corps. Delivery of these locomotives, which are being built by the American Locomotive Company, will begin in 1953.

New Factory Branch Location

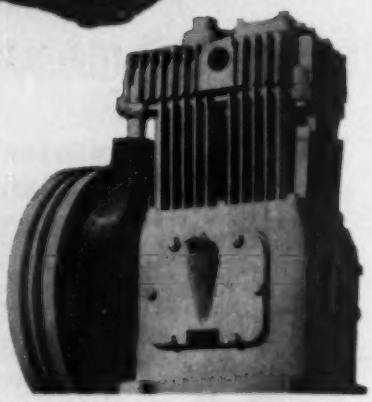
Buda Engine and Equipment Co., Inc., factory branch of the Buda Co. in San Francisco, has recently moved to new and enlarged quarters at 470 Bayshore Blvd. This location contains a complete and spacious shop for the overhaul and repair of Buda diesel engines, with facilities for engine installation in trucks and all types of industrial equipment. C. H. Riding, who has been representing Buda for the past seven years in San Francisco, will continue on as manager of this branch. Oscar Jenkins has been transferred from Buda's Los Angeles branch to take over as service manager, and Don Minot is manager of the Parts Department.

Canadian Tug

The new Canadian tug *Reliant* is now in active service since completing its trial runs last October. This vessel was built by the A. C. Benson Shipyard in Vancouver, B.C. and measures 62 feet overall with a 16 foot beam. It represents the first new tug put into operation by the Reliance Towing Co., which is headed by William S. Brooks, and will be used primarily for towing logs along the coast of Vancouver Island. Power is supplied by a 390 rpm. direct-drive direct-reversible Union diesel engine developing 260-hp.

Hilliard Representatives

The Hilliard Corporation, Elmira, N.Y., manufacturers of lubricating, fuel and industrial oil purifiers, has announced two appointments of representatives. Jules D. Gratiot Company, 1101 Riverside Drive, Los Angeles, California, will be their representatives for the state of California. The Philips Export Corporation, 100 East 42nd St., New York 17, N.Y., will be their world-wide export representatives.



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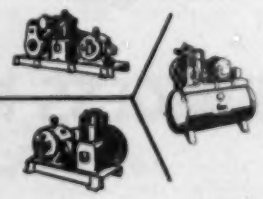

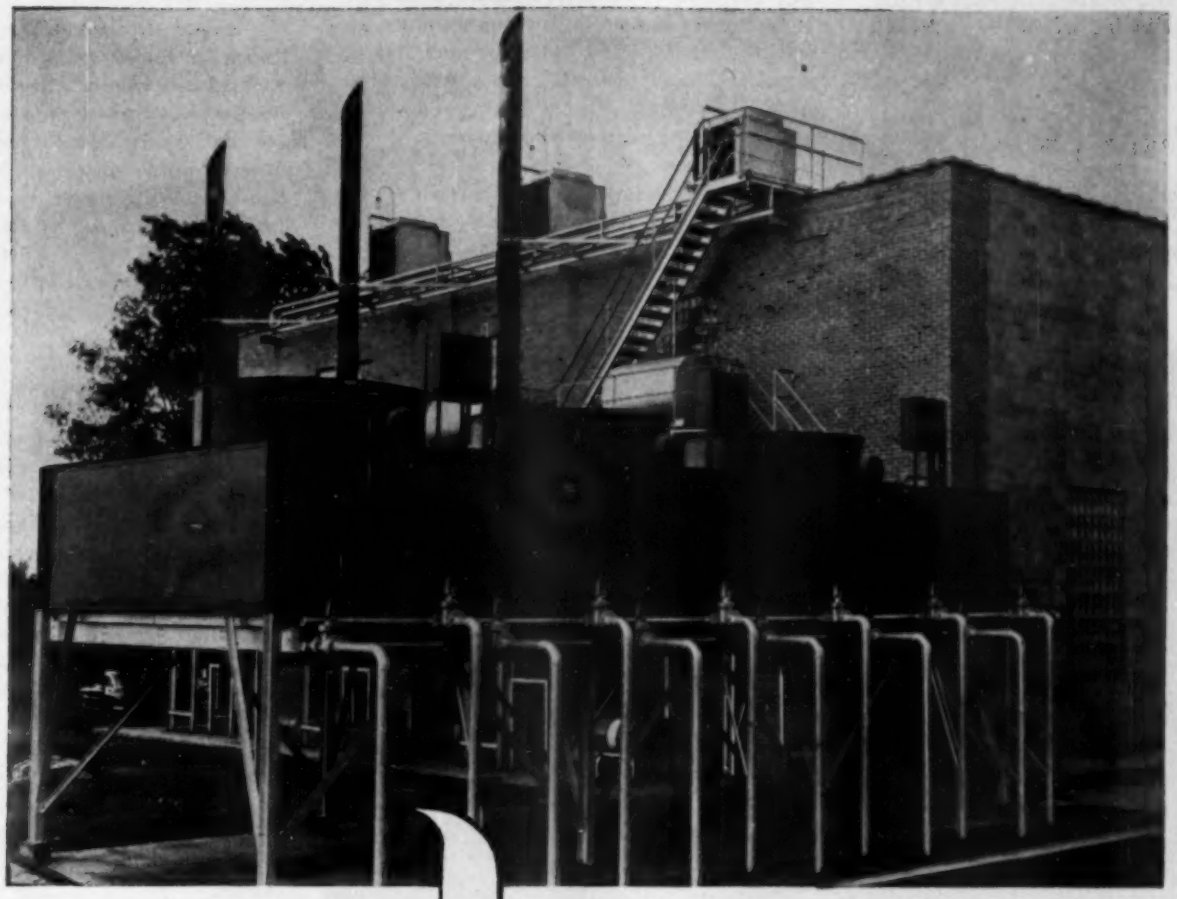

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In the plant pictured here induced draft Dri-Coolers cool jacket water for three diesels while cold water for intercoolers is provided by three Marley Aquatowers. This is a typical example of Marley's ability to meet widely varying performance and capacity requirements with standard equipment.

In fifty cities there are Marley sales engineers who will gladly show you the economy of using Marley Standardized equipment to fit your specifications and the satisfaction of purchasing pre-tested units that have been proved in service the world over.

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The Marley Company

KANSAS CITY, MISSOURI

Expands Service Facilities

J. Frank Knorr, Inc. of Miami and Tampa, Florida, have just completed a program of plant expansion at their Miami location on the Miami River at Seybold Canal. Established in 1928 at the present location, this organization has expanded its activities in both the marine and industrial engine and equipment field. During the latter part of 1952, a new and up to date repair and service shop was completed, increasing the work area of the plant by more than 100% with a second floor storage warehouse of sufficient capacity to stock several car loads of engines and equipment.

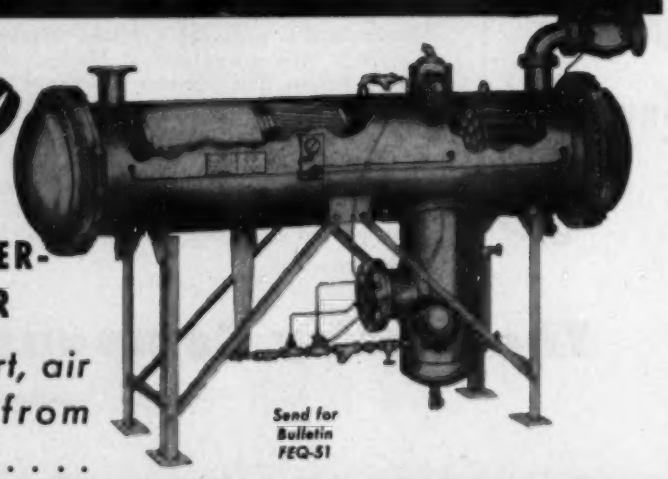
The plant is of the most modern construction with overhead crane facilities and includes other labor saving devices and tools to expedite faster and better service to the customer at lower costs. Active management in Miami is under the direction of Arthur C. Knorr, now president of that corporation. Frank Knorr, Jr., is president and general manager at Tampa.

The service departments at both Miami and Tampa are distributors for a number of first line manufacturers namely, Enterprise and Waukesha diesel engines, Snow Nabstedt reverse and reduction gears, Walter Kidde fire protection and various other accessories companies. They were recently awarded a contract from the Air Force for overhauling and rebuilding diesel engine generating units at the newly activated Patrick Air Base at Cocoa, Fla. This was an open and prime contract extending through December 31st, 1953.

There is a vast difference between the easy job of removing warm water, dirt, and pipe scale from warm diesel fuel (Vis. 35SSU @ 122°F) compared to the almost impossible job of removing cold water, or ice crystals, from cold, viscous° diesel fuel @ 10°F.

The 4-Stage EXCEL-SO Separator/Filter is designed to operate under these conditions, more efficiently, at less operating expense, than conventional single stage, or two-stage Filters only.

EXCEL-SO
4-stage
SEPARATOR- FILTER-
AIR ELIMINATOR
removes water, dirt, air and pipe scale from diesel fuel . . . . . .



Send for Bulletin FEQ-51

WARNER LEWIS COMPANY
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Modernization Program

Deep Rock Oil Corp. has expanded its blending and packaging plant at Cushing, Okla., as the first step in a multi-million dollar modernization program planned for its lubricating oil manufacturing facilities. Newest installations provide for improved packaging and materials handling facilities, a complete drum reconditioning line, greater warehouse and outloading capacity, and increased blending capacity. Deep Rock manufactures approximately 150 different lubricating oils. This operation demands speed and flexibility in operation and accuracy in blending. Proportioning and blending of base oils and additives, along with deaeration of the finished blend, is achieved by a continuous automatic blending unit. This blending unit has a finished blend capacity of 90 gallons a minute.

Can filling and packaging facilities are provided for one-quart, five-quart, two-gallon and five-gallon cans. The drum filling equipment handles 15, 30 and 55-gallon drums. One-quart cans are filled, sealed and packed in cartons at the rate of 180 cans a minute. The five-quart canning line has a capacity of 35 cans a minute. Most of the handling of cans and drums is by conveyors. New drums enter the plant by box car and are delivered to basement storage by means of an inclined skid. Another feature of the plant is a drum reconditioning line with a capacity rate of 180 drums a shift. First, the chimes of damaged drums are rolled. Hydraulic pressure smoothes out dented drums. The drums are next cleaned inside and outside by being washed with hot alkaline solution followed by a water wash. As the final step, the drums are painted both inside and outside with an enamel that is dried in an infra-red drying oven.

Southern Division Sales Manager

Farr Company of Los Angeles, manufacturers of FAR-AIR filters and air filtration equipment, announces the appointment of Donald S. Harworth as Southern Division Sales Manager with headquarters at Nashville, Tennessee. Mr Harworth recently completed his second tour of duty with the U. S. Army when he saw action in Korea and was discharged a major. He is a mechanical engineer and a graduate of the General Motors Institute.

HAMILTON DIESELS are Worth Looking Into!

COMBUSTION CHAMBER — 1
Large chamber with semi-hemispherical contours eliminates fuel oil impingement and insures high-velocity mixing of fuel and air. Combustion is unusually efficient even with low-grade fuels.

CAST IRON PISTON — 2
. . . is cooled by high-velocity oil circulation. Properly-proportioned cooling areas insure efficient cooling of rings and an even temperature throughout head.

CAMSHAFT — 3
Large diameter gear-driven camshaft eliminates vibration and maintains positively-timed sequences for all cylinders. Overhead location permits easy access to crankcase and upper level of engine . . . cuts length of high-pressure fuel injection lines.

ROTARY EXHAUST VALVE — 4
Exclusive Hamilton design entraps 40% more air in cylinder to give the best *proven* performance characteristics of any comparable engine.

PORTING — 5
Inlet and exhaust porting functions as a complement to rotary valve and entire scavenging system. Streamlined port contour permits free flow of air well above maximum rated speed. Piston rings and liners last longer because ports are located on the low-pressure thrust side of cylinder.

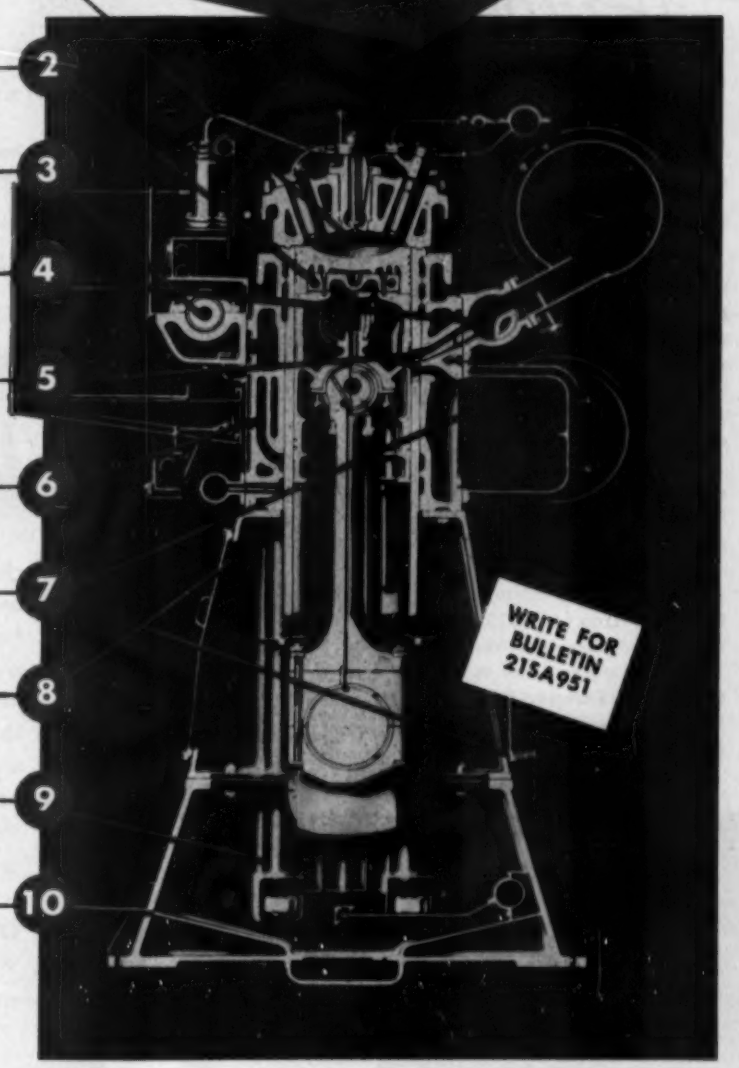
WATER JACKETS — 6
. . . are designed to insure an even thermogradient throughout the engine. Water makes two passes around block and is then directed under high-velocity across port area and around combustion space.

AIR MANIFOLD — 7
. . . is streamlined for optimum flow characteristics. Full air flow is immediately available during scavenging period.

CRANKCASE ACCESS — 8
Overhead location of camshaft allows extremely large access doors on camshaft side. Both sides of crankcase, bedplate and upper base can be easily reached for maintenance and inspection.

TIE RODS — 9
Pre-stressed rods tie bedplate, upper base and cylinder blocks firmly together . . . relieve structure of combustion load and hold it in compression even under extreme load.

WELDED CONSTRUCTION — 10
. . . of upper base provides unusual rigidity. Bedplate is either high-tensile cast iron or welded steel.



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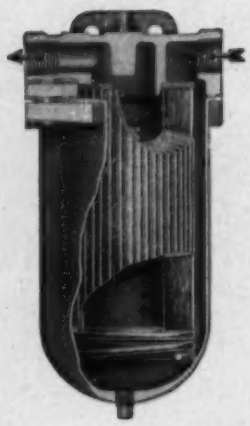

Model 3170-P filter element, 6⅛" x 3½", has a filtering area of 940 sq. in.

SKINNER PURIFIERS DIVISION OF
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Bendix AVIATION CORPORATION
Export Sales: Bendix International Division, 72 Fifth Ave., N. Y. 11, N. Y.

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This new tug is the latest addition to Western Canada's outstanding fleet. It is powered with Model L6 UNION Diesel engine, 6 cylinders, 10" bore x 14" stroke, naturally aspirated which is capable of continuously developing in excess of 300 horsepower.

The **UNION DIESEL ENGINE *Co.***
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Continuous Duty — DC

SOLENOIDS

6V—12V—24V and 32 volts

For operating throttles, chokes, fuel pump racks, and other control devices for internal combustion engines, or any application not requiring more than 10 pounds pull over ½ inch stroke. Ruggedly constructed and entirely enclosed for dust and splash proof operation. It is furnished with a mounting bracket and threaded plunger for connecting to operating linkage.

Overall length, plunger out, 4½". Overall width of mounting ears 3⅞". Weight 2½ lbs. Special plungers can be supplied if required.

For further information, write

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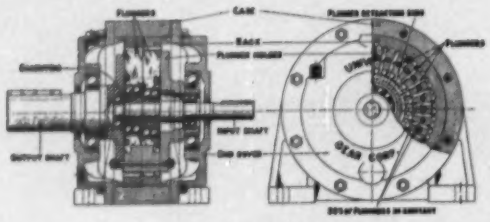
Capstan Catalog Sheets



Cross-section drawing of the Type 10V capstan drive showing the heliocentric principle of speed reduction. It involves an input shaft carrying an eccentric located centrally and an output shaft member consisting of a plunger holder which travels within a stationary rack at the rate of one rack tooth for each revolution of the input shaft.

A catalog sheet describing the Type 10V capstan drive has been issued by Universal Gear Corporation, 19th and Martindale Ave., Indianapolis 7, Indiana. The bearing arrangement on this capstan is different from the conventional in that it has overhung loads and bearings located below deck. It is completely self-contained, thus saving time spent on assembly on the vessel and it is not subject to misalignment. It has a working load capacity of 300,000 lb. in. corresponding to an average pull of 30,000 lbs. The bulletin is available upon request to the Company.

Diesel Operators Institute

The Department of Mechanical Engineering and the University Extension of the University of Kansas are planning their Third Annual Operators Institute on April 29, 30 and May 1. The program will feature qualified speakers from the various fields of diesel engine operation and manufacture, in addition to panel discussions on important problems. Suggestion of topics to be discussed are invited. Anyone wishing to attend the Institute is asked to contact George H. Brooks, assistant to the Dean, at University Extension, 115 Fraser, University of Kansas, Lawrence, Kansas.

"Coupling or Converter?"

To help both the user and manufacturer of powered equipment to better understand the application of hydraulic couplings and torque converters, Twin Disc Clutch Company of Racine, Wisconsin, has released a 32-page special issue of "Production Road," titled "Coupling or Converter?" The special issue is the result of many requests from persons in every type industry for an explanation as to where couplings or torque converters should be used, and why – and to "boil down the engineering jargon on hydraulic transmission of power, and furnish a source of clear, solid facts stripped of the technical jaw-breakers too many take for granted," stated John H. Batten, Twin Disc president.

The new "Coupling or Converter?" issue uses layman's terminology to acquaint the reader with the meaning and characteristics of torque and the effect torque has on both driving and driven equipment. Copies of the new "Coupling or Converter?" issue of "Production Road" may be obtained by writing Twin Disc Clutch Company, Racine, Wisconsin, or Hydraulic Division, Rockford, Illinois.

Diesels and Ducks

Sportsmen who demand good duck shooting stimulate much of the business done by a Los Banos, California, contractor. F. L. Gondolfi digs and cleans irrigation ditches in the San Joaquin Valley, and duck clubs and individuals who own hunting marshlands keep his equipment busy improving the hunting areas for the duck flights. Gondolfi has converted two Model 83 Byers draglines and a White transport truck from gasoline engine drive to Cummins diesel drive. This changeover to diesels, as usual, has caused significant savings in fuel costs and consumption in the work of converting this part of the San Joaquin Valley into a veritable duck hunters' paradise.

Eaton Diesel Engine Valves, Bolts, and Studs

Produced to meet the exacting requirements of Diesel Engine Service

A background of many years of experience as suppliers to the Diesel engine industry gives Eaton a thorough understanding of the peculiar problems encountered in this highly specialized field. Eaton has made far-reaching engineering contributions applicable to practically all types and sizes of Diesel engines. Greatly enlarged manufacturing facilities permit the production of highly-stressed main-bearing and connecting rod bolts with forged heads, under strict metallurgical and quality control.

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Gulf Coast Diesel News

By MICHAEL T. PATE

PHILLIPS Petroleum Company, Houston, has equipped a new 83-foot crew boat for marine drilling operations servicing with 2 General Motors Series 110 diesel marine propulsion engines with 2:1 reduction gears to drive the twin screws.

THE NEW drilling barge being built for Baker Littlefield, with Power Rig Drilling Company, will be equipped with three Waukesha Model NKDU Diesels, two on the drawworks, one on the mud pump, and also with one Model 148 DKU Diesel for auxiliary power and one Model 190 DLCU for standby service. Waukesha Sales & Service, Inc., Houston, made the installation on this all-Waukesha powered barge.

KERR-McGEE Oil Industries, Oklahoma City, has installed two General Motors Series 110, diesel engines to power two 100-kw., dc. generator sets on its new diesel-electric drilling barge.

BROWN & ROOT, Inc., Houston, has secured through Stewart & Stevenson Services, Inc., one General Motors Series 71, diesel marine engine for dredge service, and one General Motors Series 71, diesel engine powering a Stewart & Stevenson Model 12 MD 160 dc. electric generating set for dredge service.

PORT HOUSTON Iron Works, Houston, is installing seven MDC 645 Buda diesel engines, rated at 55 hp. each, to drive vertical cargo pumps in as many gasoline barges being built for the Army Transport Service. Buda Engine & Equipment Company, Houston, furnished the engines.

LIBERTY Fish Company, Galveston, Texas, will drive its new 85-foot shrimp boat with one General Motors Series 110, marine diesel propulsion engine through 4.5:1 reduction gears.

HAMMAN Oil Company, Houston, Texas, has secured two General Motors Series 110, diesel engines to provide power for one Oilwell Model 2-14 mud pump on their deep drilling rig.

THE J. A. JONES Construction Company, Charlotte, N. C., has purchased through Buda Engine & Equipment Company, Houston, seven DC 1879, 200-horsepower diesels for installation on the pipeline the Jones Company is building through the Andes for the Ecuadorean government.

GARWOOD Dehydrating Company, Garwood, Texas, has purchased one General Motors Series 71, diesel engine to power a self-propelled forage harvester the company is developing.

THE TUG *Anna C* being built by Bludworth Shipyard, Inc., for the J. D. Cayton Towing Service, of Houston, is being equipped with two Buda DCMR 1879 diesels, to drive 48x28 wheels through 2:1 reduction gears, and each developing 171 hp. at 900 rpm. The tug will also have two Buda BD 153, 10 kw. auxiliary generating sets.

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Precision and Quality Workmanship, backed up by 38 years of Erie experience, are yours for thoughtful buying. Whether you require a fastener made from carbon, alloy or stainless steels, to special design, to exacting specifications, Erie fasteners will save you time and expense . . . from your planning, to procurement, to fabrication. Submit your fastener requirements to us, Erie Service will meet the challenge.
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Bay Area Diesel News

By BRUCE WADMAN

SAN FRANCISCO, February 15: The contract for the four engine driven pumping units to be installed in the Thirty-fourth Street Storm Water Pumping Station in Oakland has been awarded to Enterprise Engine and Machinery Co. The pumping station will be located near the distribution structure of the Bay Bridge and will have a total capacity of 450,000 gal./min., with each pump equipped to handle a maximum of 112,500 gal./min. The construction of this pumping station has been undertaken to alleviate the excessive flood conditions experienced by the West Oakland district in the past. The four Enterprise diesel engines will each drive an Economy Pumps Inc. pump through Pacific Western gears. These 8-cylinder diesels develop 1200-hp. at 560 rpm. The station is designed to be completely automatic, including Westinghouse Air Brake automatic starting and automatic speed control for the engines. The inlet channels will converge into a main concrete incoming pipe of 108 in. diameter. The discharge conduit will be a 6 ft. by 10 ft. concrete box culvert approximately 2400 ft. long and will discharge into the Bay in the flood channel of Temescal Creek. Two small electric-driven pumps will be installed in the station to handle normal water drain-off. Tests of the station design for the hydraulic characteristics of the inlet channels are being conducted in the University of California hydraulics laboratory.

FOR THE Jackson Hole Light & Power Co in Jackson, Wyoming, a 500-kw. generator set has been installed. The Fairbanks-Morse generator is driven by a model 38-D-8 ⅛ opposed piston Fairbanks-Morse diesel developing 800-hp.

• • •

THE Pittsburgh-Des Moines Steel Co. in San Jose has purchased a 60-kw., 480-volt GM generator set to be used primarily for 300-amp. welders. The Delco generator is driven by a GM 6-71 diesel. This unit is connected to eight different welders, which can all be used at the same time. A transformer attachment with eight receptacles for 115-volt application is another feature of this set. This is the third unit of this type to be purchased by Pittsburgh-Des Moines Steel Co.

• • •

THE Eleventh Annual Meeting of the National Rural Electric Cooperative Association was held in San Francisco from January 26 to 29. The general sessions were held at the Civic Auditorium, with panel-forum meetings at the Fairmont Hotel. The problems and the future of the N.R.E.C.A were discussed at this meeting, which was keynoted by the theme, "The challenge of N.R.E.C.A.'s second decade." The problems and future plans of the REA Power Division were included in the agenda of this meeting.

• • •

TWO 200-kw. generator sets with power supplied by Fairbanks-Morse model 32-E-14 diesels have been sold to P. S. Pell & Co., the Fairbanks-Morse distributors in Honolulu, Hawaii. The two engines are rated at 300-hp. each.

FOR emergency power in the Mills Memorial Hospital in San Mateo, a 150-kw. generator set has been installed. For the San Mateo County Hospital a similiar unit has been installed, this one being a 125-kw. set. Each generator is driven by a GM 6-110 deisel. West Coast Engine & Equipment Co. has supplied automatic controls for each unit that start the diesels within 15 seconds after power failure.

• • •

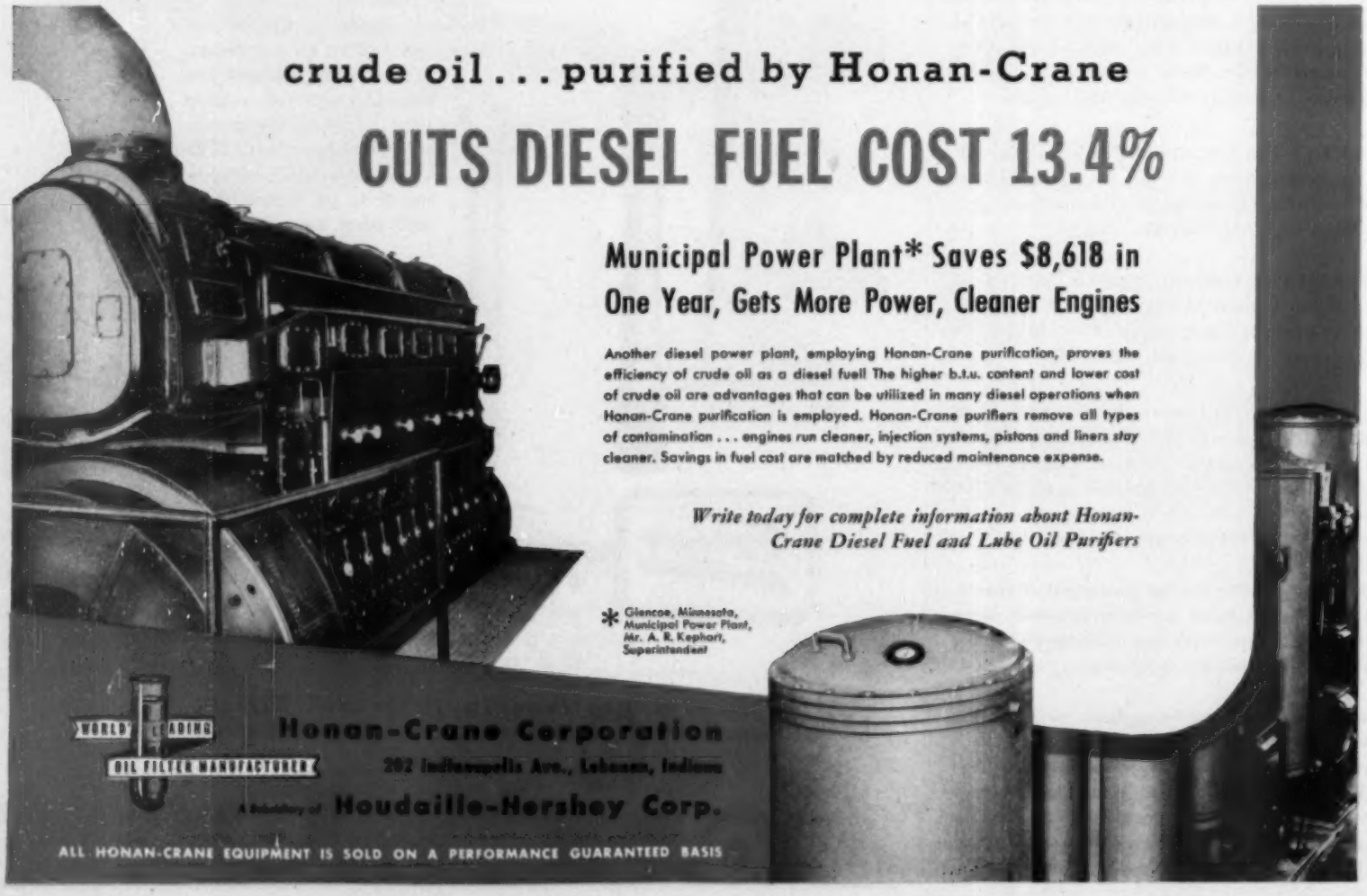
FOR repowering a Northwest model 80 shovel, a Murphy 150-hp. diesel supplied by Oswald Machine Works has been installed, replacing a Twin Cities gas engine. For conversion to diesel drive, a Northwest gear train assembly has been installed in the shovel, which is owned by Gallagher & Burke Inc. of Oakland.

• • •

A FLEET of ten Allis-Chalmers HD-20 diesel tractors has recently been supplied to a large contractor for shipment to an overseas operation. GM 175-hp. diesels power these tractors, which are equipped with Twin Disc hydraulic torque converter drive.

• • •

THE new tug *Redwood City* has recently been put into operation by the Harbor Tug and Barge Co. of San Francisco. Two Caterpillar D-397 diesels, developing 400 hp. each, provide the power bank for this tug, which measures 64½ ft. length, 19 ft. beam and 6 ft. draft. Falk pneumatic reverse and reduction gears drive this twin-screw vessel, which will be used for general towing in San Francisco Bay and its tributaries.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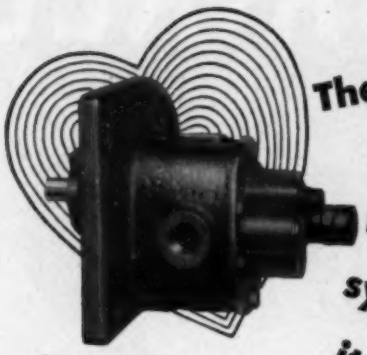

The HEART of a diesel lubricating system is its PUMP

Rotary geared pump with special flange mounting becomes integral part of diesel engine when installed. Note opening above relief valve for tachometer.

Modern diesel operation generally requires a pressure lubricating system — and the vital element is the pump. Thousands of Brown & Sharpe pumps are now providing reliable service month after month without interruption, for lubrication, transfer, or booster systems. Available with various types of flange mountings and special internal construction to meet specific requirements. Write for catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

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ALL MODELS AVAILABLE IN EITHER CONSTANT SPEED OR VARIABLE SPEED TYPES.

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DIESEL ENGINE CATALOG

The purpose of this little advertisement is to tell you about Volume 17 of DIESEL ENGINE CATALOG which is now available, entirely revised and rewritten. This is the 17th edition of the book that has earned the name of "the bible of the industry."

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People who sell, people who buy, people who use diesel engines need this new, fully illustrated, up-to-the-minute volume. It has been completely revised and expanded. Orders are now being accepted for this latest edition. Price $10.00 prepaid.

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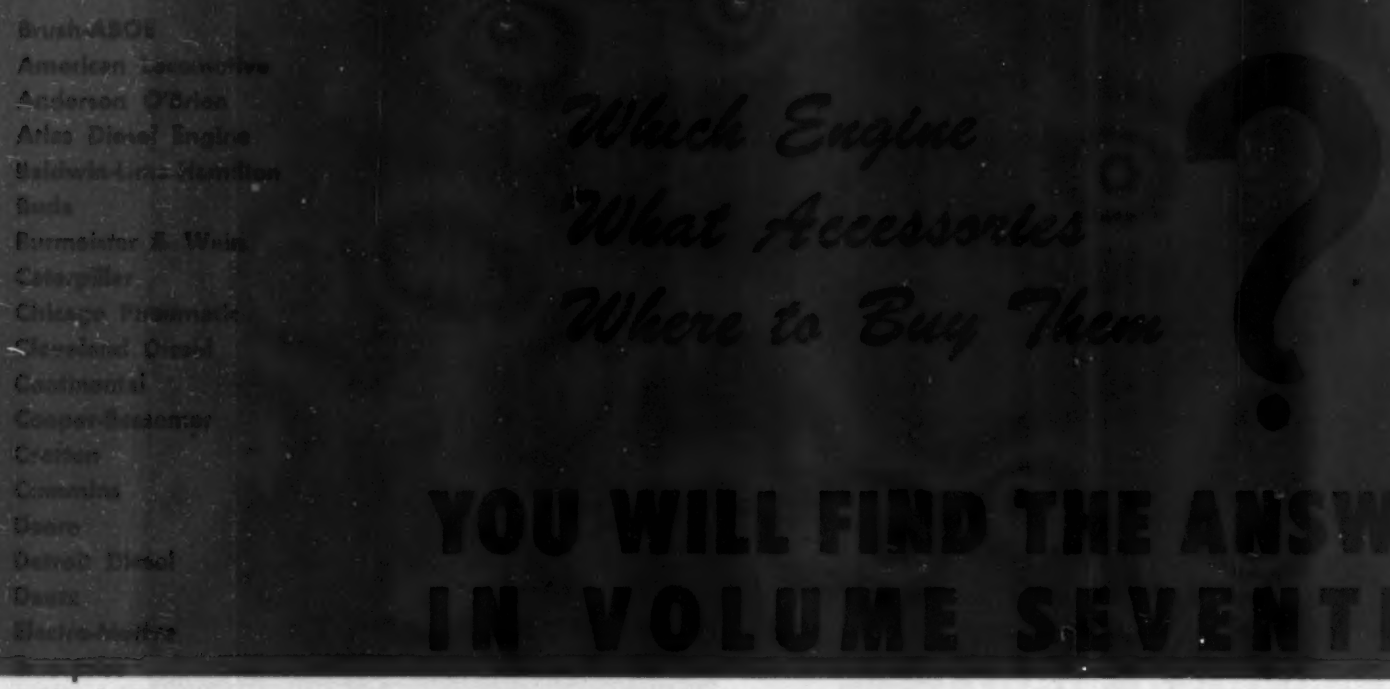

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Its comprehensive classification and indexing contribute to making it easy for you to find the information you want. Five books in one with five integral sections, this catalog is indispensable whether for technical reference or selective buying. The five sections break down as follows: (1) An engine section fully illustrated with complete technical descriptions and specifications. (2) An accessory section describing engine and plant accessories. (3) A transmission section describing torque converters, etc. (4) A classified buyers guide giving valuable information as to the source of many items you buy in the diesel industry. (5) The advertising section which further details the manufacturer's product.

Designing and consulting engineers keep DIESEL ENGINE CATALOG at hand for easy reference throughout the year. Product engineers found its accurate, easy-to-find data of great value in their work. Engine operators use its wealth of factual information as an invaluable aid to good maintenance and service. Technical instructors and students consult it as an unsurpassed reference book.

If *you* are not already using Volume Seventeen, it can save you time and money, too.

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Enter my order today for a copy of the Diesel Engine Catalog, Volume Seventeen, Edited by Rex W. Wadman, for which I enclose $10.00 (Plus sales tax if for delivery in Calif.). Copies may be ordered in the Sterling Areas by remitting £4:0:0 to DIESEL PROGRESS, St. Paul's Corner, Ludgate Hill, London, E.C.4.

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(ALTERNATOR)

150-Ampere Output Capacity

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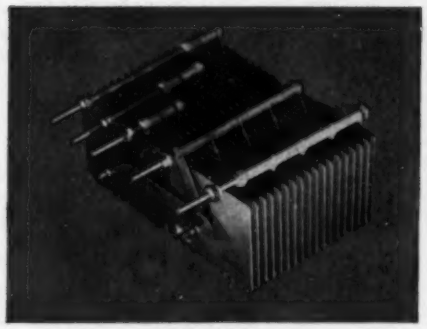
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The new Delco-Remy A.C. generator is the heart of a 12-volt A.C.-D.C. electrical system designed specifically for modern Diesel buses with fluorescent lighting and extra-heavy electrical loads.

It cuts in at approximately 550 generator rpm and reaches a maximum output of 150 amperes at approximately 1175 rpm.

The new generator not only supplies alternating current for fluorescent lighting, but also ample direct current for the heaviest electrical loads coupled with lengthy engine-at-idle periods.

Impressive features of the new generator are its relatively light weight, its very high output capacity and its ability to operate over a wide range of speeds.

Specify Delco-Remy electrical equipment on your new buses.

DELCO-REMY

Division, General Motors Corporation, Anderson, Indiana

WHEREVER WHEELS TURN OR PROPELLERS SPIN

The Versatile Locomotive

GM diesel locomotives starting for the far ends of the earth. *Left:* 1500 hp. freight locomotive for the Alaska Railroad, and *Right:* 1500 hp. freight locomotive for Saudi Arabia.

The enormous range of versatility of the standardized diesel locomotive as developed by Electro-Motive Division of General Motors was exemplified in shipments of "F" type General Motors locomotive to Saudi Arabia and to Alaska within a few days of each other at the turn of the year. The locomotives are the standard 1500 horsepower freight locomotive units used so widely in the United States, each with the same basic power plant, transmission, car body, trucks and controls but with variations in equipment that make one set of locomotives able to cope with the extreme heat and dust conditions of the Arabian desert and the other to operate successfully in the sub-zero and heavy snow and ice conditions of central Alaska.

Two of the units went to the Saudi Arabian Government via an eastern seaport by rail thence to Bahrein, Saudi Arabia by sea. They will operate combination freight and passenger trains over the 370 mile line between Bahrein and the capitol city Riyadh. Before the establishment of this railroad shortly after the close of World War II by the Arabian American Oil Company, all supplies from the sea coast went to the capitol by camel train. There still is considerable caravan traffic on the desert road running alongside the railroad. The units are distinguished by their bright green and white color scheme (for high visibility against the interminable sand of the country they will traverse) with the crossed sabres and palm tree insignia of the Saudi Arabian Government Railroad on their noses. They are supplied with insulation and cab ventilating equipment to help keep the engineers and firemen comfortable in the high desert heats and have special air filters to protect engines from dust and sand.

Six units were started to the U. S. Government-operated Alaska Railroad. These will operate as three-unit 3000 horsepower locomotives hauling freight between Anchorage and Fairbanks and between Anchorage and Seward. They are equipped with snow plow pilots and with special winterization equipment in the engine room to prevent freezing and icing of the engine cooling system, fuel and lubricating lines.

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C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES INC., 653, TENTH AVENUE, NEW YORK 19, N.Y.
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Named Penflex Distributor

The Pennsylvania Flexible Metallic Tubing Company, Philadelphia, has appointed as their distributor in the New Orleans territory the firm of Murray-Baker-Frederic, Inc., 626 S. Peters St., New Orleans, La. With the addition of the Penflex line, this new distributor is equipped to supply industry in that area with the latest in flexible metallic hose developments and improved technical service.

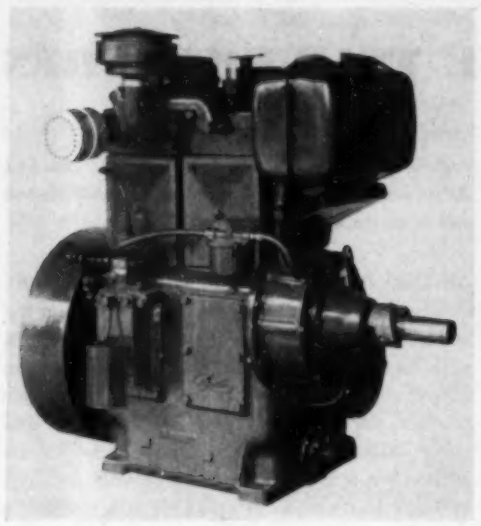
Murray-Baker-Frederic will serve the territory covering New Orleans, Mobile, Baton Rouge, Jackson, and neighboring communities. They will handle the complete line of Penflex products, including Penflex interlocked galvanized steel and bronze hose, blower and ventilation hose, tar and asphalt hose, marine unloading hose, hose for gasoline pumps, tank wagon distillates and fuel oil, and Penflexweld, with jointless, seep-proof walls, for the safe handling of modern high volatiles.

Orders Ten Diesel Switchers

The Atchison, Topeka and Santa Fe Railway Company has ordered ten, 1200 horsepower, diesel electric switchers, from Fairbanks, Morse & Co., it was announced last month by Robert H. Morse, Jr., President. Delivery is to start in the spring and the locomotives will be built in the Beloit, Wisconsin, Works of the Company, he also stated.

YOUR COPY OF DIESEL ENGINE CATALOG in its seventeenth completely re-edited, revised and expanded edition is now available. An invaluable aid to design engineers and buyers, it incorporates the latest diesel engine specifications and descriptions. Order your copy of this limited edition now. Profusely illustrated. $10.00. Mail checks to DIESEL PROGRESS, 816 North La Cienega Blvd., Los Angeles 46, California.

Novel Compressor Set



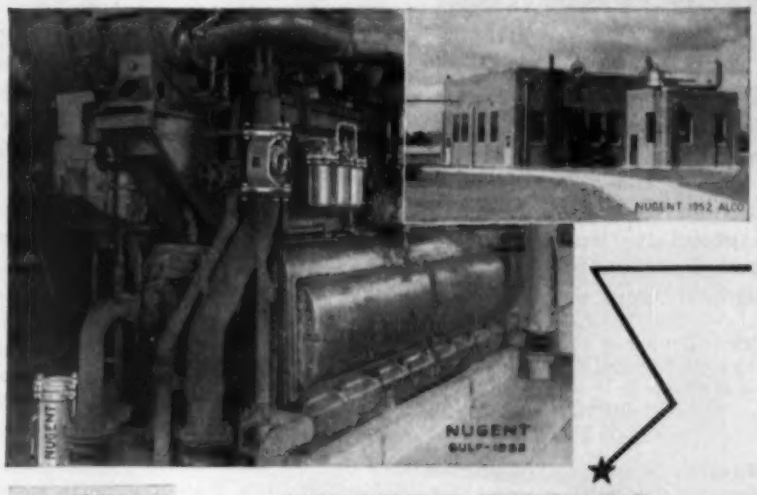
The Petter Small Engine Division of Brush ABOE, Inc. has recently introduced a new and novel unit into its list of products. Without any major alteration to its basic structure the popular twin cylinder AV2 diesel engine has emerged with one power cylinder replaced by a compressor cylinder, thus producing a compact and powerful water-cooled air compressor set capable of an output of 8 cubic feet of air per minute at a pressure of 350 psi. At an alternative setting 15 cubic feet per minute at 100 psi. continuous rating can be obtained. The versatility of this unit is further enhanced by the retention of the Petter half speed output shaft enabling the user to take off up to 3 hp. at 750 rpm. for generator or pump service with the compressor running unloaded. Apart from the cylinder head and piston, no further spare parts other than standard parts at present available are required.

The AV2C Compressor is suitable for marine auxiliary, mobile or stationary applications in many fields where a rugged source of compressed air is required to give long, trouble-free service at a low running cost. This unit will in future form part of the standard starting equipment of large diesel sets up to 3,000 hp. manufactured by Brush ABOE's Heavy Engine Division.

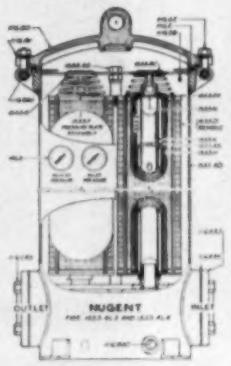
Power Rating Chart

Just issued and available for general distribution is a six-page, fold-out power rating chart carrying all models, features, specifications and power ratings of Waukesha diesel, gasoline, propane or butane and natural gas engines and power units. Each type of engine and power unit is treated in a separate tabulation which greatly speeds up and simplifies finding the exact unit required for given conditions. In addition to the tabulated engine data, the chart carries a statement of the rating test conditions, a visual separation of permissible speeds for continuous and intermittent service, a sectional view of a typical Waukesha power unit and a montage showing many applications.

The two-color chart folds to standard file size and is punched for a three-ring binder. This useful, informative chart will be sent to all requesting Bulletin 1079 on their letterhead direct to Waukesha Motor Company, Waukesha, Wisconsin. Please mention DIESEL PROGRESS.



Nugent Sight Flow Fitting. Shows flow of water to the jackets.



Size #4L4 Engine Lube Oil Filter.

Nugent Duplex Fuel Oil Filter.

NUGENT FILTERS

HANDLE THE COMPLETE JOB on this 1170 H.P. Pumping Station Diesel

LOCATED at Stateline Station, Union City, Ind., the 8 cylinder Alco diesel illustrated is a vital cog in the Gulf Oil Company's Tulsa-Lima Pipe Line. That's why the fuel oil and the entire lubrication system of this 1170 H.P., Turbo-charged engine is protected by Nugent filters and a Nugent Sight Flow indicator.

A Nugent #1R Duplex Fuel Oil filter on suction of fuel pump and Nugent #1R on discharge of fuel pump keeps the fuel oil clean for trouble-free injection — a Nugent #4L4 Engine Lube filter cleans all the engine lube oil in circulation every cycle before going to the bearings. A Nugent Sight Flow indicator provides a visual check on water flow to the jackets.

By actual test, Nugent filters remove particles as small as a few microns and prevent them getting to where they can accelerate wear and tear and shorten engine life. In addition Nugent Filters offer a choice of full flow or by-pass filtering with the same unit. Recharges are inexpensive and easy to install. Simple piping makes installation no problem.

Write for descriptive literature that shows how to insure the long life of your diesel.

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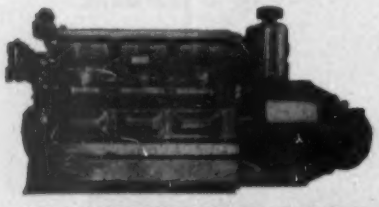

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SHUTTERS CONTROL ENGINE TEMPERATURES

EXPERIENCE has shown many advantages accruing from proper regulation and control of engine temperatures. A generally higher than normal operating temperature has proven beneficial in reducing sludge formations in crankcases and valve chambers and temperature regulation within close limits has resulted in more favorable wear rates and lower specific fuel consumption. These statements refer specifically to overall engine operating temperatures but the variation of temperatures that occur under ordinary thermostatic regulation, from top to bottom and from front to back of engine blocks, need ironing out because they cause distortion with resultant wear and failure.

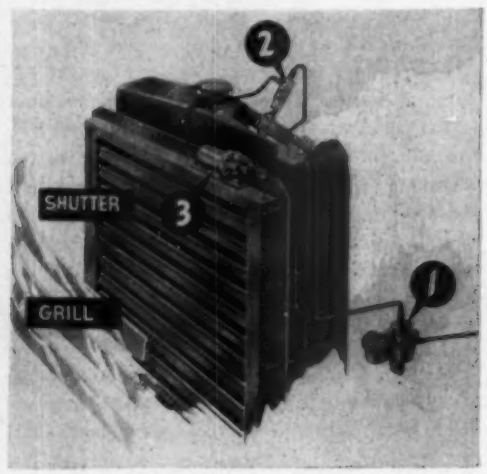
The ordinary thermostat does a big job in controlling engine temperature. Most engines need a thermostat. But on many types of operation the thermostat, in its usual location cannot maintain uniform temperatures throughout all parts of the engine block. In a way, it is similar to the human body which is also a heat engine. To keep warm we pile on more clothes so that the cold air surrounding us can't get at our radiator—that is, the skin. However, if we put on two pairs of pants, shirt and parka and forget to keep the cold away from our feet, we can get a peculiar sensation. We may be hot-headed, but at the same time our toes may be frozen.

Large diesel truck operating in the mountains where long, down grade drifts can reduce engine temperatures dangerously low unless proper protection is provided.

That is what can happen in any gasoline or diesel engine. In warm weather everything may be fine, but with a reduced outside air temperature, the cylinder head temperature may be near 180 deg. as indicated by the heat gauge, yet the bottom end of the cylinder block or walls may have a temperature as low as 90 deg. F. Now, it is desirable to keep the block and head at a uniform temperature for obvious reasons. One is the need to have the engine oil at a temperature at which it can best do its job without contamination by condensation and other undesirable products.

Obviously then, if the engine oil is in contact with metal at about 90 deg., its temperature cannot be maintained at 140 deg. or better. In addition, this problem of maintaining crankcase and oil-pan temperature is increased by the action of the air flow and fan blast blowing over the crankcase and lower section of the cylinder block. Another important point is that cylinder wall wear increases by leaps and bounds as operating temperature is reduced. Taking 180 deg. as an ideal, wear will increase as much as 50% with a 20 deg. drop in temperature.

One question often asked is: how can the lower cylinder wall temperature drop so low with a high head temperature? The answer is quite simple. Think for a minute of how a cooling system operates. The hot fluid, as allowed out by the thermostat, goes to the top of the radiator core. On an average engine working normally it reaches there at anywhere from 160 to 190 deg. Then the air flowing through the core cools the fluid as it passes downward. At the bottom of the core it may not be more than 20 to 30 deg. higher than the outside air temperature. So this cool water goes direct to the pump and lower section of the cooling passages in the cylinder block.

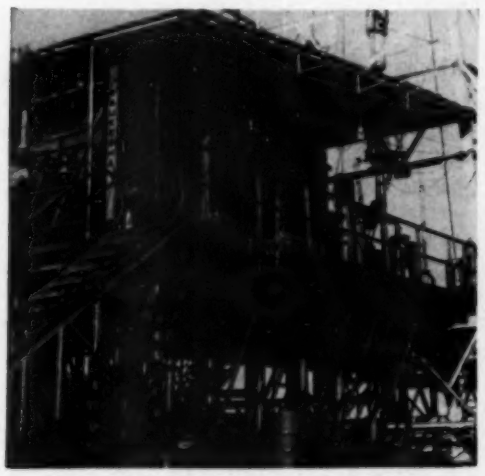


Installation diagram of the Kysor automatic radiator shutters of the pneumatic type: 1. air filter; 2. shutterstat control; 3. air cylinder. Units supplied for hydraulic and vacuum action.

Now, if the engine is not working hard it may be that the fluid temperature entering the bottom of the block is almost as low as the outside air temperature. So, on really cold days, the coolant at this point may be down as low as zero. However, there is a certain amount of heat which transfers down the cylinder block from the head. This, added to the warmed water in re-circulation from the by-

pass system, helps keep the lower parts at a slightly higher temperature than the water in the bottom inlet tube. The harder the engine works, the more heat is lost to the cooling system, so that under full power operation the entire system may get up to nearly the proper temperature even on a cold day. But immediately the load is reduced by easing back on the accelerator, the air flow through the core contributes to considerably lowering the water inlet temperature.

Actual tests on an engine operating in near-zero weather have shown some surprising things. Outlet temperature at the top of the head was held to a fairly constant 190 deg. by the standard thermostat. This temperature was taken right at the thermostat housing. Temperature at the back of the head, at a point between the block and head, showed a temperature of about 160 deg. F. Temperature at the inlet to the cylinder block (from bottom of radiator) varied from 30 to 140 deg. This lower cylinder jacket temperature varied with the load put on the engine. In other words, running light or at idle, the lower cylinder water temperature went down to 30 deg. F; while at full-



Three diesel engines on a drill rig with Kysor automatic shutters. Benefits are often greater in high ambient conditions than generally expected.

load operation the jacket temperature ran up to 140 deg. F.

This gets us around to two or three points. First, with so much fluctuation in lower water jacket temperature it is impossible to keep the lubricating oil at a proper temperature. Second, with cylinder wall temperature below 180 deg. F., engine wear is greatly accelerated. Manufacturers indicate that cylinder wall jacket temperature should be kept at 160 deg. F., or higher, for minimum wear. Another major point to be considered is the effect of the comparatively cool engine oil in the operation of the filter. It seems that a filter cannot do a good filtering job on cold oil. In fact, oil just does not flow through the filter in adequate quantities until it is warmed up. So, in addition to acids and condensation we have grit and blowby products circulating through the engine, and the filter medium cannot do all it should about it with a cold running engine. The detrimental effects of contaminated lubricant are well known to fleet operators. Plugged rings, corroded pistons and pins, valve trouble, scored crankshaft journals—these are only a few of the problems encountered when engine oil temperatures are kept at a constant low point while the engine is in operation.

What then is the solution? How can all this be overcome? It would seem as though some control of the air flow through the radiator core and around the engine would be of great help. There are on the market automatic radiator shutters designed to do this job and do it effectively. Naturally any such unit has to be designed, manufactured and calibrated for each make and type engine application it is to serve. Therefore if an operator is considering the use of such a device he should consult the engineer acquainted with these units and determine the exact requirements for his particular operation.

Usually when a shutter unit is installed the standard control thermostat is left out. If this is not done the shutter control cannot do a complete job of maintaining coolant temperature throughout the entire system. With radiator shutters it is claimed that variation between coolant and oil temperature can be held within narrow limits and coolant temperature is also held within narrower limits than usual—that is, 7-8 deg. Some claims for engine operation with shutter control of coolant temperature are: improved valve operation and life, reduction in block distortion and resulting wear and failure, reduction in abnormal engine wear and damage due to temperature extremes, and reduction in operating troubles and excess costs of maintenance involved in operations such as stop, start driving.

National Society Honors Engineer

T. O. Kuivinen

Sigma Xi, national honorary society, recently elected to its ranks, Mr. T. O. Kuivinen of The Cooper-Bessemer Corporation, Mount Vernon, Ohio. Associated for many years with Cooper-Bessemer's highly technical engineering development program, Mr. Kuivinen was recently made chief engineer's assistant. As a member of the Office of Chief Engineer, Mr. Kuivinen is well known throughout the industry for the development of many highly technical phases of engineering in the design of compressors, gas, diesel and gas-diesel engines. A graduate of Ohio State University, Mr. Kuivinen was elected to Tau Beta Pi, honorary engineering fraternity. Because of his exceptional talents in the field of engineering, he was also made an associate of Sigma Xi. As is the policy of Sigma Xi to watch the progress of its associates, the Society has now elected Mr. Kuivinen to full membership in recognition of his outstanding contributions.

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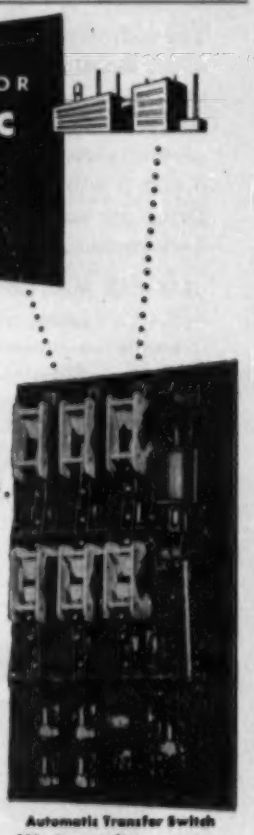

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TITUSVILLE, PENNA.

Florida Diesel News

By ED DENNIS

ECUADOR, S.A., six Sterling diesel engines with 75-kw. General Electric generators for mining operations in the Andes Mts. from Auto Marine Engineers of Miami.

THE *MURRY D II* of Puerto Cortez, Honduras, powered with three General Motors diesels and two 25-kw. Hercules generating sets, loaded with diesel equipment for Turk Island, B.W.I.

THE *PHYSALIA*, 80-ft. marine laboratory of the University of Miami being repowered with 2 G.M. 6-71 diesels, Oliver Farm Equipment Co. marine reduction gears, Delco batteries; engines from Diesel Power Co.

SEMINOLE QUEEN II, repowered with a model HNR 602 Cummins 150-hp. diesel, Snow Nabstedt reduction gears; to replace a 4-cyl. which has been trouble free since 1938; sister ships are the *Biscayne* and *Seminole Queen I*, engineered by Florida Cummins Diesel of Coral Gables.

TAMIAMI TRAILWAYS of Tampa is placing in service $560,000 worth of 41 passenger Silverside Thruliners, powered with G.M. 6-71 diesel engines; which will bring them up to a total of 60 busses.

RECENT G.M. 6-71 diesel engine sales included one for the Mexican shrimp trawler *Carnan*, another for the Cuban freighter *Le Nessa* and the yacht *Sabol* received a set of twins.

JOHN FINDEISEN has been appointed general manager of sales, parts and service on Caterpillar marine diesel engines at Shelley Tractor and Equipment Co., Coral Gables. He comes to Florida with over 16 years of service at Peoria, Ill.

FROM Brander Shipyard, Biloxi, Miss., and Murphy powered, is the *Southern Belle*, a 70 x 21 trawler for the Three Friends Shrimp Co. Snow Nabstedt 3:1 reduction gears, Goulds & Fairbanks-Morse pumps, Surritte batteries.

A THIRD G.M. diesel trailer added to the Singleton Shrimp Co trailer fleet. Each trailer has its name across the front, such as *Shrimp Daddy*, *Poor Papa* and *Change of Luck*. Singleton also operates an all-diesel trawler fleet from Tampa and Fort Pierce.

FROM Gibbs Corp. at Jacksonville, the *Jo Ann*, a 67 x 18 shrimp trawler for Charles Ludwig of Tampa to fish Campechee, Mexico; powered with a Caterpillar D 13000, Snow Nabstedt 3:1 reduction gears, Twin Disc clutch.

HARNISCHFEGER CORP. opened a new sales office, warehouse and service station in Birmingham, Ala., to serve the Southern States. In addition to the P. & H. diesel engine this firm also manufactures power shovels, cranes and welding equipment.

FOUR TOWBOATS recently powered with G.M. diesels: tug *A. T. Beardslee* from a single to a double screw with 275 hp. each; two 6-71's at 165 hp. in a pusher type tug for N. R. Horton of Bayou La Batre; a 6-71 in a steel towboat for Twenty Grand Inc. and a 4-71 at 110 hp. for J. M. Rodgers of Moss Point; all from Kennedy Marine Engine Co of Biloxi, Mississippi.

J. E. WATSON, who formerly represented Allis Chalmers in Birmingham, Ala., has been appointed to take charge of that company's Miami office, according to a recent announcement by D. S. Kerr, manager of the Southeastern region of the company's General Machinery Division.

ALL MURPHY powered are the six new shrimp trawlers from Modern Trawlers of St. Augustine. All have Snow Nabstedt reduction gears and Twin Disc clutches. The 190 hp. Murphy diesel engines came from Jacksonville Yacht Storage.

RECENT DIESEL TALK: The *Judith Fay* with a model D-50 Lathrop going to Key West; the shrimper *Roselle* had a 165 hp. G.M. installed; the *Lady Betty II*, Caterpillar and Hercules powered, has a new home port at Jacksonville; and George Codrington's 80-ft. *Sea Play* at Daytona Beach Boat

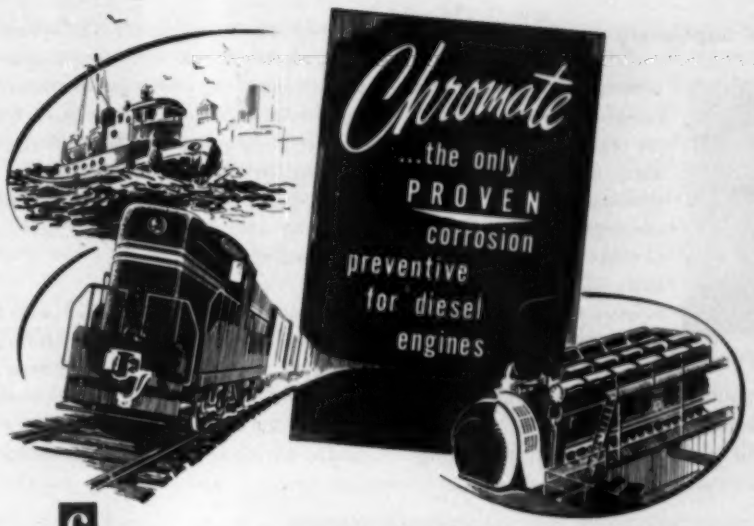
Opens New York Export Office

A. S. Callan

The opening of a new export office in New York City has been announced by Hiram Hascall, general sales manager of D. W. Onan & Sons Inc., Minneapolis, manufacturers of electric generating equipment. Located in Room 1501, 141 Broadway, New York 6, the office is created for the purpose of facilitating the handling of Onans export business in the metropolitan area. The new office will also add to the convenience with which Onan customers from foreign fields, and visiting in New York, may be served. Named as manager of the new office is A. S. "Scotty" Callan, Allerton, New York. A graduate of Cooper Union and New York University, Mr. Callan holds a B.S. in Electrical Engineering and for the past eight years has been associated with the International Standard Electric Company of New York where he was active in foreign installation and survey work. As sales engineer with International Standard Electric, Mr. Callan has worked closely with Onans and is thoroughly familiar with Onan products.

Fairbanks-Morse Appointments

Robert H. Morse, Jr., president of Fairbanks, Morse & Co., recently announced the appointment of F. M. Mason, Jr., as coordinator of U. S. government business. Mr. Mason was formerly director of engineering. Also J. F. Weiffenbach, formerly vice president in charge of manufacturing of the Canadian Locomotive Company, Kingston, Canada, has been appointed to the position of chief product engineer, Manufacturing Division.



CHROMATES are the only tried and true answer to controlling cylinder-liner corrosion in diesel engines. Use of chromium inhibitors is universally accepted by locomotive builders.

Sodium chromate stops corrosion before it starts. The presence of this one chemical renders the metal surface passive to corrosive attack. Slight oxidizing action occurring upon initial contact produces an additional safeguard—a protective surface-deposit of iron and chromium oxides.

Diesel locomotives require only 2000 to 2500 ppm sodium chromate at pH 8.5 to 9.5 to minimize the combined effects of vibration and corrosion. Other units such as standby boilers, stationary and marine diesels, hot water heating systems, and automobile radiators vary in their anti-corrosive requirements from 200 to 5000 ppm sodium chromate. It is important that sufficient chromate concentration be maintained at all times, for to leave valuable equipment unprotected even for short periods may result in serious damage.

Mutual, the world's largest manufacturer of chromium chemicals, supplies the chromates necessary for cooling system protection. Information about corrosion prevention in all types of cooling systems will be sent upon request.

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For other features, write for Bulletin 294

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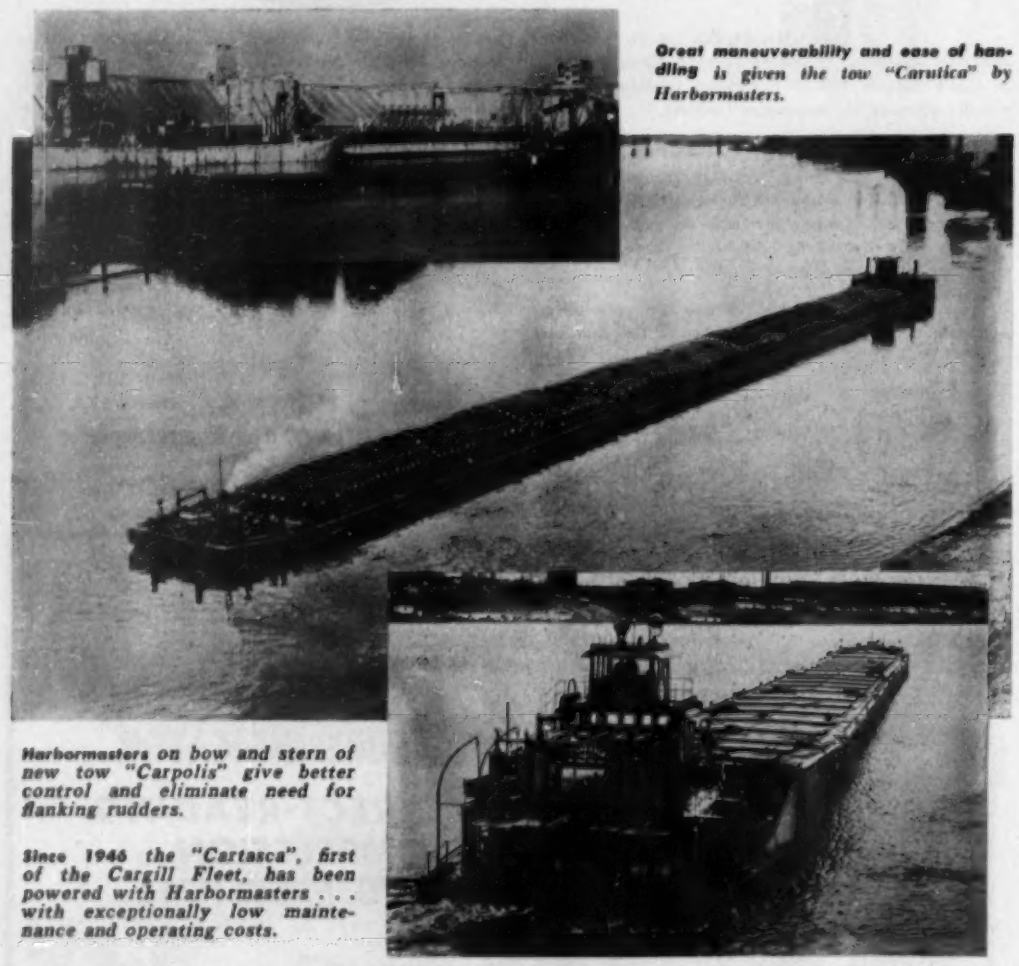
Forms New Subsidiary

M. M. Perry

Formation of The Perry Company, manufacturers of the Perry cooling system filter, as a wholly-owned subsidiary of the R. M. Hollingshead Corporation of Camden, N. J., has been announced by Wilbur H. Norton, Hollingshead president. M. M. Perry, who developed the electro-chemical filter, will become president and general manager of the new firm which will be operated out of Camden. It succeeds the Perry Filter division of the Spark-o-Liner Corporation of Minneapolis, Minnesota. Mr. Perry, a native of Michigan, attended the University of Illinois and began his career in the automotive field with General Motors Corporation in the Oldsmobile plant at Lansing. He will be joined in his new position by J. A. Vettel, former sales manager of the Perry Division, who will continue in that capacity and serve as a vice-president.

The manufacture of the filter will be the first mechanical production for the Hollingshead Corporation, which is one of the largest automotive and aviation chemical firms in the world. The electro-chemical action of the Perry Filter retards corrosive pitting and keeps the entire cooling system clean. Introduced in 1949, the filter has been accepted by major automotive and diesel manufacturers. Among the firms that have approved the filter as optional equipment are White, Mack, GMC Truck and Coach Division, Chevrolet, Buda, International Harvester Industrial Division and Euclid Road Machinery. It has been approved by Allis-Chalmers, Flexible Coach, Waukesha, Twin Coach, Detroit Diesel, International Harvester Truck Division and Ford. The chemically-activated filter of the Perry unit prevents costly breakdowns and, as a result, the filter has been acclaimed by fleet owners since its introduction in 1949. It cleans both the motor block and radiator of lime, scale, rust and other debris, keeping the water or other coolant clean and clear. No inhibitor or cleaning compound is necessary.

W. H. Lukens, a 26-year associate of the Hollingshead Corporation and its former sales manager, will become chairman of the board of the new subsidiary. Other officers will include: R. LeKashman, vice-president; J. Laputka, treasurer; and P. Jones, secretary. Mr. Perry's addition to the Hollingshead organization strengthens an executive lineup started last spring when Norton left a vice-presidency with General Motors to head the 65-year-old Camden firm. Other recent additions include Donald O. Severson, vice-president and director of sales and merchandising.



Great maneuverability and ease of handling is given the tow "Carutica" by Harbormasters.

Harbormasters on bow and stern of new tow "Carpolis" give better control and eliminate need for flanking rudders.

Since 1946 the "Cartasca", first of the Cargill Fleet, has been powered with Harbormasters . . . with exceptionally low maintenance and operating costs.

OUTBOARD PROPULSION gives better control on new 598 foot tow "Carpolis"

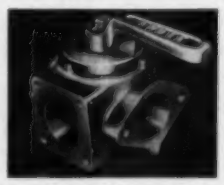
A 300 H.P. Harbormaster Outboard Propulsion and Steering Unit installed on the "Carpolis" midway between the two main propulsion units gives the tow positive steering without flanking rudders . . . as well as an added 300 H.P. for propulsion. A 130 H.P. Harbormaster is mounted on the nose section. Controls running to the pilot house give the pilot perfect control of bow.

Harbormasters give the Cargill Fleet a high degree of maneuverability and efficiency. Harbormaster Propeller Thrust Steering gives ease of handling on the river and through the locks. The "Carutica" (upper left), one of twin tows, is shown coming into the grain elevators at Albany. Another of the Cargill Fleet, the "Cartasca" (lower right) has been completely powered and controlled with Harbormasters since 1946. She also has a Harbormaster on the bow with controls running to the pilot house. Maintenance costs have been exceptionally low.

Greater maneuverability, efficiency and low operating costs can be gained by installation of Harbormasters on barges, scows, derricks, lighters, etc. Send today for big Harbormaster catalog . . . over 70 photos and diagrams . . . and see how outboard propulsion can help you.

Murray & Tregurtha, Inc., 6 Hancock St., Quincy 71, Mass.

New Recirculating Valve



A unique recirculating valve that may be used for any stream dividing application of gases, air, salt water, oil and mild chemicals to 125 psi is now in production. The design incorporates a novel combination of time proved plug valve principles and O-ring scaling. It is claimed that a positive leakproof condition is obtained and that handle loads and internal wear are reduced to a minimum by the use of an externally adjustable seating control featuring multiple ball pressure contact against a hardened wear ring. Ardee Mfg. Co. reports recent tests indicate minimum pressure drop and full orifice flow characteristics in 2-in. size now being produced.

The valve is available in cast aluminum, steel or Navy bronze. Bronze and steel valves are cadmium plated throughout. Flange connections are available for either male or female thread adaptation. For detailed information write DIESEL PROGRESS, File 103, 816 No. La Cienega Blvd., Los Angeles 46, Calif.

Propeller Bulletins

Kahlenberg Bros. Co. of Two Rivers, Wisconsin has issued two bulletins describing their line of ship propellers. Bulletin No. 89 describes a number of their standard propellers and gives informational data on custom built screws. Because of the increasing demand for individually engineered marine propellers, this latter is of great interest. Bulletins No. 89 and No. 89-2 are available upon request to the company.

Inland River Reports

By DAVID I. DAY

THE mild weather of early January cleared the ice from Peoria Lake, impounded portion of the Illinois River at Peoria, Illinois, and the towboats were running much as in summer. The government boat *Fern*, triple screw, Fairbanks-Morse 960 hp. has done most of the ice-breaking this winter with the *Sumac*, sister diesel cutter, standing by to aid if needed. The contract ice-breakers, the *Harriet Ann* of the Upper Mississippi Towing Corp., 3200 hp. Fairbanks-Morse powered, and the *Northern* of the Mississippi Valley Barge Line with Fairbanks-Morse power, 3200 hp., were still in commercial operation as February neared. If conditions warrant, they can, however, connect with ice-breaking plows immediately.

WE OBSERVED the big 215-ft. *New Orleans* just below New Boston, Ohio, on the Ohio recently—a rather odd sight now when newer diesel vessels are so much more compact. This vessel is about 3200 hp., using General Motors twins.

THE upper Mississippi champion coal pushers in warmer weather, the *A. M. Thompson* and the *Central*—Mississippi Valley Barge Line towboats—are making a reputation in winter work on the Ohio—the *Central* has a number of huge tows to her credit and recently lost a propeller (fixed up immediately at Jeffersonville, Indiana, yards). The *Thompson* has made some of the fastest runs with tows recorded so far. They are in the 2600-3000 hp. class, both with Enterprise diesel twins.

THE new towboat for Federal Barge Line being built at Sturgeon Bay (Wis.) shipyards will be named the *Inwaco* and will be powered with twin Nordbergs, and the plan is to have her on work trips in April.

FROM Howard Tremaine a letter dated Jan. 20 and in New Orleans says: "I observed the Federal Barge Line boat *Helena* getting new and larger diesel engines at the Avondale Marine Ways here—the engines being General Motors, 2400 hp."

THE rivermen at Pittsburgh were startled lately to see the *Petco 20* tied up there. This nice boat of the Petco Corporation, Milwaukee, is well known on the Mississippi but this was her first trip the full length of the Ohio. She has twin General Motors, totaling 1800 hp.

NOTHING tells better the passing of the steamer on the rivers than the coal trade above Cincinnati, often called "the last stand of the stern-wheel steamboat." Nearly all the tows noted on our January trip were in charge of such noted diesel vessels as the *Charles R. Stevenson*, the *Robert W. Lea*, the *Lucy Jane Lucas* and the *James D. Francis*, powered in order with Fairbanks-Morse, General Motors, General Motors, Superiors.

WE NOTED the *Chippewa*, G-M powered, in January on her way from Houston, Texas, with a big tow of sulphur for Duquesne, Pennsylvania, as she passed Paducah, Kentucky, on the lower Ohio.

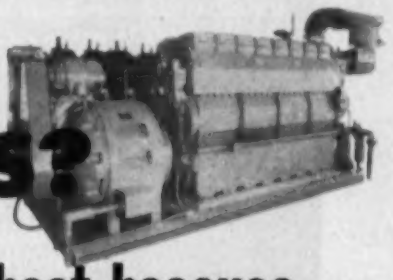
WE SAW the big *Jefferson* of the American Barge Line in mid-January above Louisville but did not know at the time that Capt. John Frost was in the pilot house "on his own" now. He had a fine reputation as a steersman and we predict a great career as a river pilot with "papers of his own." The *Jefferson* continues the same smooth runner she has been since she started to work over ten years ago. She uses Cooper-Bessemer twins, 2000 hp.

APPROACHING Catlettsburg, Kentucky, was the *Paul Chotin*—formerly the *Jos. Chotin*—making her first run under the new name. Back some years ago she was a steamboat. Now she is powered with Cooper-Bessemers, 1600 hp.

WE HAVE two snapshots from Mrs. Ella Laug near Pittsburgh showing the *C. F. Wood* (Fairbanks-Morse twins) of the U.S. Steel fleet towing two old steamers to be junked. The steamers were the *Edgar Thomson* and the *Clairton*.

THE GOOD diesel tug *Roland*, once of the C. J. Dick fleet at Houston, Texas, is now flying the flag of the National Oil Transport Co., NYC. We have a picture of her shortly after her completion at Bludworth Shipyard, Houston. The tug has an Enterprise diesel engine about 800 hp.

THANKS TO Joe Kerney, Pittsburgh, for a picture of the rose-colored *Barry Dean*, demonstrating her Caterpillar 400 hp. engine on the Ohio.



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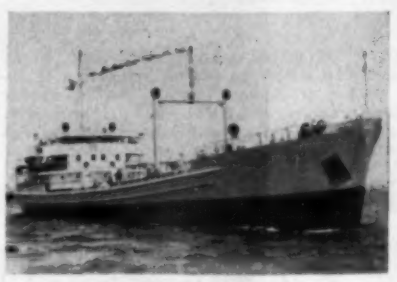

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3. To make sure serious damage cannot come from circulating left-over wastes through the engine, the Extrinol in D-X causes them to be surrounded in molecules of oil and held in suspension.

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Manager Export Department

Jerry G. Rizzo

Jerry G. Rizzo has been appointed manager of the Export Department of the Elliott Company. His offices are located at 271 Church Street, New York. A graduate electrical engineer of Columbia University and Polytechnic Institute of Brooklyn, he has been in export work for the past six years, particularly in connection with power plant, steel mill, and marine propulsion and auxiliary equipment. He has traveled extensively throughout the world in negotiation work for power plant equipment.

Executive Appointment

A second top executive appointment in Borg-Warner Corp.'s two Rockford plants was disclosed recently with an announcement that Harry L. Emerson will become president and general manager of the Rockford Clutch Division. Mr. Emerson, previously vice president in charge of manufacturing, succeeds Arch A. Warner, who earlier was appointed president of the Mechanics Universal Joint Division of Borg-Warner. Mr. Warner's predecessor was G. C. Gridley, who requested retirement as president of Mechanics but will remain with Borg-Warner in a consultative capacity.

"We are pleased that in Mr. Emerson we have an executive of trained and proved leadership who can step into the position left by Mr. Warner," president Roy C. Ingersoll of Borg-Warner said. Mr. Ingersoll also announced the promotion of G. L. Christianson to the position of executive vice president of Rockford Clutch. Mr. Christianson previously held the title of vice president and assistant general manager.

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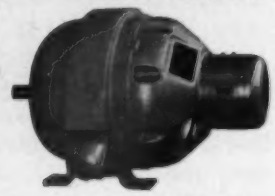
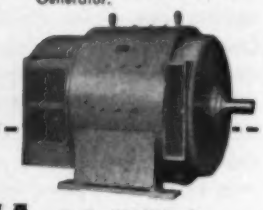


Above: 93.8 KVA, 900 RPM, A.C. Generator with Direct Connected Exciter.

Below: 200 KW, 900 RPM, Protected, Two Bearing D.C. Generator.



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Write for the Tuthill Pump Guide listing all Tuthill Pumps for lubricating requirements. Send specifications for quotation.

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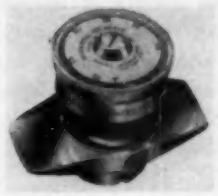
Metal Hardness Tester



A new Ernst tester permits, for the first time, according to the manufacturer, metal producing and metal working plants to obtain superficial readings with a portable instrument. It makes possible on-the-job metal hardness testing; tests without damaging the material or part. This Ernst portable superficial metal hardness tester gives direct dial reading in Rockwell "15N" Scale, 70-95. Accuracy is guaranteed by individual assembly and individual calibration of each instrument against certified laboratory standards. The tester is extremely easy to use. Simply place the tester on the material to be tested, press downwards on the handgrips. A direct reading is obtained on a large easily read dial.

Three factors make this instrument ideal for testing small parts and finished pieces: (a) unique low load, (b) small indentation, (c) minute diameter of penetration. The tester will not collapse shapes which cannot be tested with other testers. It eliminates the old base-plate or pressure-screw clamp attachment design of other testers making possible the testing of any size, shape and type of metal almost without limit. The tester has a spring-loaded diamond penetrator indentor. Readings appear on a 2-inch diameter scale. To take a hardness measurement, the handgrips are pressed downwards. This action lowers the indentor housing to bring the under surface of the tester against the surface of the material to be tested. After which, further depressing of the handgrips ensures that the point of the indentor penetrates the surface of the test material under the action of the carefully calibrated helical spring. The movement of the indentor as it penetrates the material slightly compresses the diaphragm of a fluid-filled chamber. Fluid is thereby forced further into the capillary tube, which encircles the dial, to indicate the hardness number on the dial scale. The movement of the indentor into the material is magnified about 3,000 times by the fluid displacement in the capillary tube. The final position of the fluid indicates the hardness value directly on the scale.

The weight of the instrument is 30 ounces and has a height of 3 inches. The maximum indentation is .003 inch and the maximum diameter of penetration is .006 inch. They are available in Rockwell A, B, C, 15N scales and Brinell low and medium scales from Newage International, Inc., 235 East 42nd Street, New York 17, N. Y.

Moves to New Plant

Air-Maze Corporation, manufacturer of air and liquid filters, has announced the opening of its new plant and general offices at 25000 Miles Road, Cleveland 28, Ohio. It is located on 30 acres of ground and the plant itself has over 150,000 sq. ft. of floor space. A modern example of suburban industrialization, the new plant was designed by McGeorge & Hargett, architects and engineers, and built by Albert M. Higley Co., builders, at a cost of over $1,500,000.

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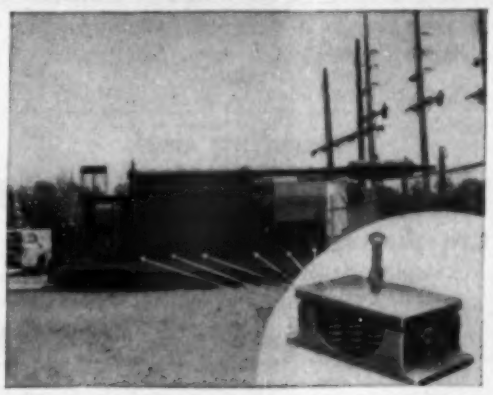
For more information, see our page in the "Diesel Engine Catalog" for 1952; our catalog G-104 in Sweet's Files; or write us for copies—yours for the asking.

Special recommendations on request, without obligation. A half century of experience is at your disposal. Representatives in principal cities.



Baldwin 550 H.P. diesel generator mounted directly on Korfund steel-spring isolators without special foundation on this truck trailer. The Vibro-Isolators were also used to prevent distortion of the engine generator as the truck twisted when traveling over rough fields. Rural Cooperative Power Ass'n, Elk River, Minn.

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Macy's, New York.....1 700-hp. Alco
Floyd Bennett Field, New York.....1 450-hp. Fairbanks-Morse
Prudential Insurance Co., Newark, N. J.....1 740-hp. Baldwin
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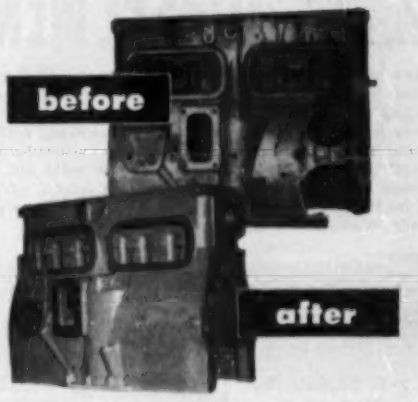

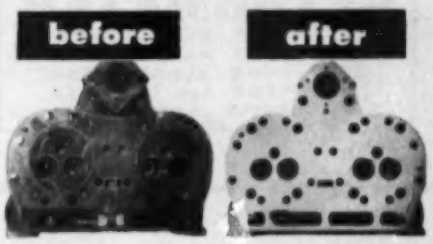

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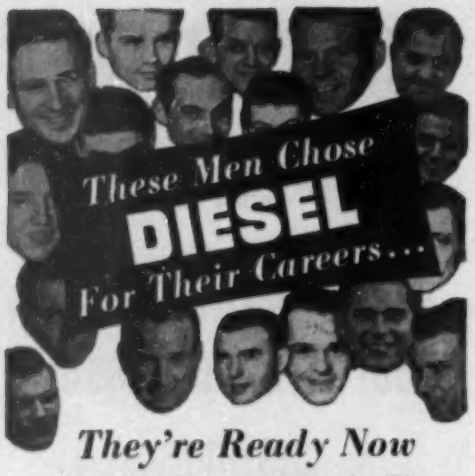

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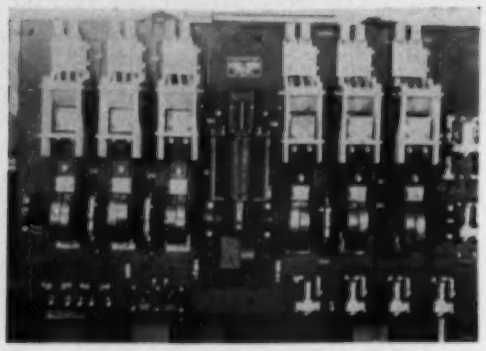

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Automatic transfer switches on emergency diesel generating sets, an important part of our civil defense efforts, The Automatic Switch Company has issued a series of bulletins outlining the features, applications, fundamental design requirements and other informational data on their automatic transfer switches. Used to provide continuity of power in cases of the breakdown of the normal source of electricity, these switches serve to protect life and property by automatically connecting the load to a secondary source of power. Standard transfer switches automatically restore the load to the normal source when it is again in normal operating condition, regardless of the condition of the emergency source. A prime requirement of emergency automatic transfer switches is that the operating mechanism should be sturdy and simple and not dependent on delicate parts, hooks or latches. The range of these Asco transfer switches is from 5 to 1000 amperes for all types of loads. The capacity to withstand the inrush of tungsten lamp load, the severe arcing from inductive loads and the heating effects of short-time fault currents is an important feature of these switches.

Their new booklet, to be ready for distribution soon, entitled "Automatic Transfer Switches," will include discussions on close differential voltage supervision, arrangements to ignore momentary outages, emergency electric plant installations, accessory devices and other factual information. This booklet will be sent free on request to Automatic Switch Company, 385-D Lakeside Avenue, Orange, New Jersey.

Valves for High Pressure Applications

A bulletin is now available showing typical applications of the Atkomatic Solenoid electric valves for high pressure lines. Aktomatic Solenoid high pressure valves are made in sizes from ½ inch to 1½ inches, and for pressures to 3,000 psi. Designed with only 3 moving parts and no external linkage, normal valve maintenance is further reduced by the packless construction incorporated in the design. These valves can be used for any application where the media is not harmful to bronze or stainless steel. Coil housings for various conditions are offered in dust-tight, watertight or explosion-proof housings for use in hazardous atmospheres. This bulletin on high-pressure valves may be obtained by writing to DIESEL PROGRESS, File No. 104, 816 No La Cienega Blvd., Los Angeles 46, Calif.

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West Coast Diesel News

By **FRED BURT**

FOR Bell, Colfax & Daniels, Bakersfield drilling contractors, oil-well unit rig drilling equipment from Mid-Continent Sup. Co, Los Angeles; drawworks powered with two 200-hp. Cummins diesels and Twin Disc converters; dual 300-hp. Cummins diesels on mud pumps.

THE first of 13 large Cooper-Bessemer diesel engines has just been delivered to National Steel & Shipbuilding Corp., San Diego, for powering 100 ft. tugs under construction for the Navy.

TWO 220-hp. natural gas engine powered Ingersoll-Rand, skid-mounted, portable compressors (fabrication by Guy Martin Co., Gardena, Calif.) have been delivered to the new Boston plant of Southern California Gas Co. near Avenal, Calif., for use in boosting line gas pressure.

FOR automatic booster water pumping (controlled proportionately to demand) at new water pumping station of Whittier Utility Supply Co. at Puente, Calif., two 30-hp., one 60-hp. and one 130-hp. new Buda natural gas engines are direct-connected to centrifugal pumps.

FROM Cummins Sales & Service, Los Angeles, for Pipe Linings Inc., South Gate, Calif., a Cummins 110-hp. diesel-electric, portable unit for use in supplying light at different field operations.

ADDED to the earth-moving and excavating equipment of Rose Hills Memorial Park, Calif., is a new No. 90 Caterpillar scraper and a D8 tractor super-powered with a D17000, 170-hp. diesel; also with dozer blade one foot higher than normal.

THE 38-ft. Albacore boat *Southwind* of San Diego (Mike Cavenee, skipper) has been repowered with a 60-hp. P & H diesel by Engine Sales & Service, Terminal Island.

PURCHASED by Long Beach Oil Development Co. for use in Huntington Beach oil-gas field, three 550-hp. natural gas engine driven, 5-cyl. high compression, Clark right angle compressors – all cooled with one Vapor Phase unit, thermal circulation; no pumps.

DELIVERED to Texas Co., Long Beach, a Hopper Hoistmobile well-servicing unit, powered with 225-hp. Hall-Scott natural gas engine (also adapted for L-P gas fuel) driving through Allison Torque converter.

IN ADVANCE of delivery of 23 similar units purchased by Southern Pacific Co., an Alco-GE 1600-hp., six motor diesel road switcher demonstrator is being given trials on Southern California S.P. lines

FOR boosting gas line pressure, Pacific Lighting Gas Supply Co. has installed four 660-hp. Ingersoll-Rand natural gas engine driven compressors at their Ventura station.

PURCHASED by Bratton & Sturges, El Centro, Calif., contractors, three Allis-Chalmers scrapers powered with 165-hp. Cummins diesel engines.

INCREASINGLY used in Utah-Colorado mining areas are special, individually propelled 1½ cu. yd. ore cars, hydraulically dumped; all power, each car, from a single 1- cyl. 5½-hp. Hallett air-cooled diesel engine.

A NEW model, 4,000 lbs. per batch, Madsen (Iron Works, Los Angeles) asphalt plant, built for Peter Kiewit Sons Co (first to be used for AC paving at Mojave Air Base) is powered with Caterpillar diesels; 265-hp. (156-kw.) diesel-electric set for all remote control motors; 200-hp. for pug mill; and 103-hp. for dust collector.

THE NEW ski-lift at Snow Summit, Big Bear Lake, Calif., is being powered by a 140-hp., 6-cyl. General Motors diesel, driving through a GM torque converter.

SOLD BY Shepherd Tractor & Equip. Co., Los Angeles, to W. A. Droe in the cotton and grain growing area of Coburca, Sonora, Mexico, a 120-hp. Caterpillar diesel, to power a Smith deepwell turbine pump for irrigation purposes.

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Elliott Turbocharged, of course!

Here is another of the many community power plants that are getting maximum results from their diesels—in both capacity and economy—with Elliott turbochargers.

Bellefontaine, Ohio, has three new turbocharged Superior diesels, each with a turbocharged rating of 1423 bhp. The engines, of 360 rpm, each drive 1000-kw generators. They are dual-fuel engines, operating on gas during the summer, when the city's gas plant produces a surplus, and on normal diesel fuel at all other times. The periodical change of fuel makes no difference to the efficient operating of turbochargers. The new station is less than a year old, having started operation April 5, 1952 to help meet a growing load beyond the capacity of the steam plant already in service. In addition to Elliott turbochargers, several Elliott Crocker-Wheeler motors are used in the plant to drive engine auxiliaries.

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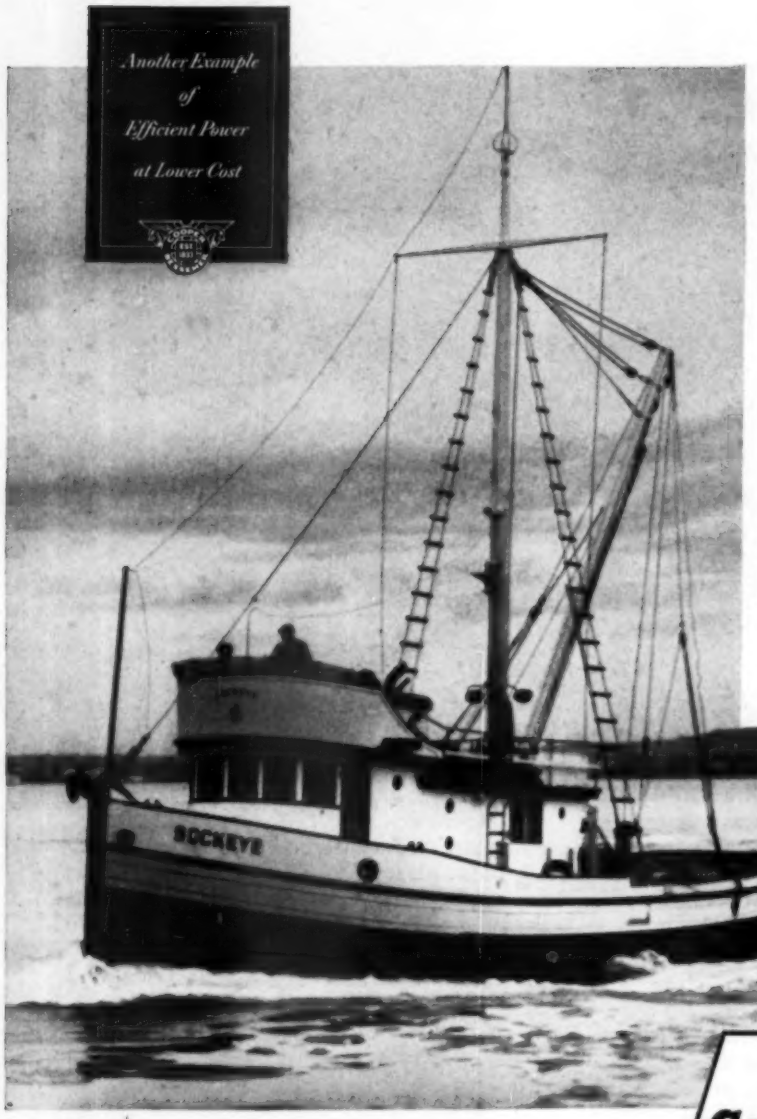

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The 76-ft. "Sockeye," now Cooper-Bessemer-powered with a 250 hp FW-6, was built at Tacoma in 1948, was rebuilt in Bellingham in '51. This hard-working boat, owned by Friday Harbor Canning Co., is skippered by Capt. Bill Mason. Chief Engineer is John Wade.

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